VOL. LXXXIV PART THREE

JOURNAL OF THE ROYAL HORTICULTURAL SOCIETY

MARCH 1959

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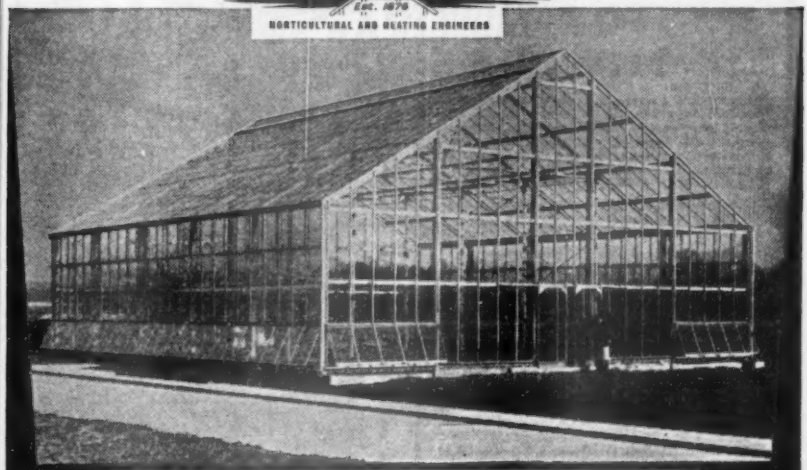

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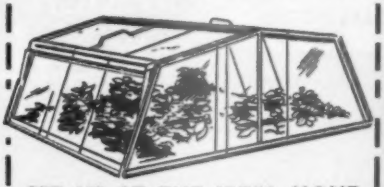

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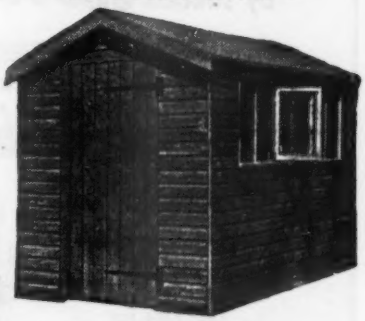

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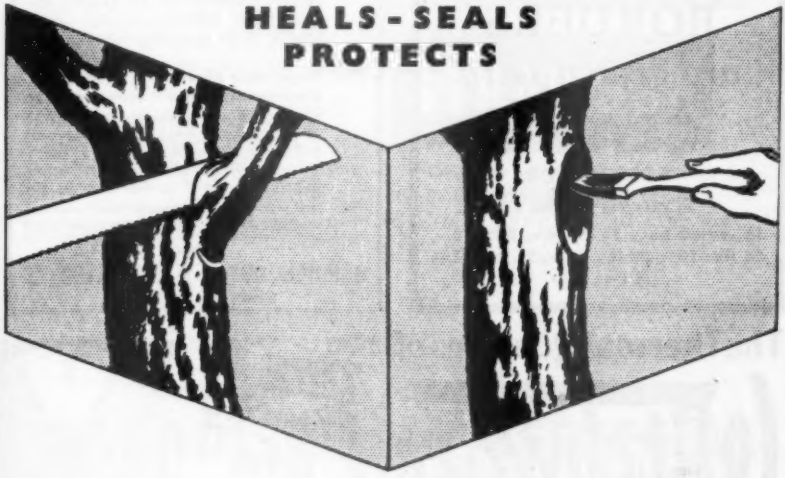

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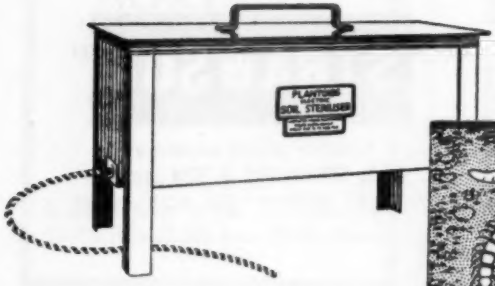

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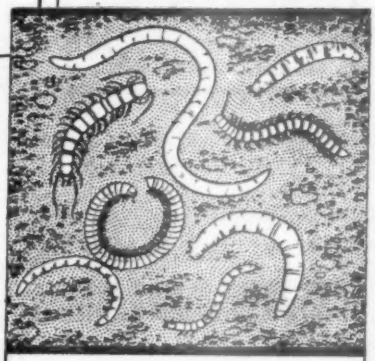

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JOURNAL OF THE ROYAL HORTICULTURAL SOCIETY

VOL. LXXXIV PART THREE

March 1959

THE SECRETARY'S PAGE

ANNOUNCEMENTS—MARCH AND APRIL

Shows

TUESDAY, March 10 12 NOON to 6 P.M. WEDNESDAY, March 11 10 A.M. to 5 P.M.	Fortnightly Flower Show and Alpine Garden Society's Competition, in the New Hall. British Orchid Growers' Association's Show, in the Old Hall.
TUESDAY, March 24 12 NOON to 6 P.M. WEDNESDAY, March 25 10 A.M. to 5 P.M.	Fortnightly Flower Show, Daffodil Competition, Rhododendron Competition and Sewell Medal Alpine-house and Rock-garden Plant Competition for Amateurs, in the New Hall.
TUESDAY, April 7 12 NOON to 6 P.M. WEDNESDAY, April 8 10 A.M. to 5 P.M.	Fortnightly Flower Show and Camellia Competition, in the New Hall.
TUESDAY, April 14 12.30 P.M. to 6 P.M. WEDNESDAY, April 15 10 A.M. to 5 P.M.	Daffodil Show, in the New Hall. Alpine Garden Society's Show, in the Old Hall.
TUESDAY, April 21 12 NOON to 6 P.M. WEDNESDAY, April 22 10 A.M. to 5 P.M.	Fortnightly Flower Show, in the New Hall.

Lectures

TUESDAY, March 10, at 3 P.M. "The Control of Variation in Garden Plants", by MR. WATKIN WILLIAMS, M.SC.

TUESDAY, March 24, at 3 P.M. Masters Memorial Lecture: "Plants and the Weather", Part I, by PROF. J. P. HUDSON, M.B.E., G.M., M.SC., PH.D., N.D.H.

TUESDAY, April 7, at 3 P.M. Masters Memorial Lecture: "Plants and the Weather", Part II, by PROF. J. P. HUDSON, M.B.E., G.M., M.SC., PH.D., N.D.H.

TUESDAY, April 14, at 3 P.M. "Miniature Daffodils", by MR. D. BLANCHARD.

TUESDAY, April 21, at 3 P.M. "Lilacs", by MR. F. P. KNIGHT, F.L.S., V.M.H.

Demonstrations at Wisley—The following demonstrations will be given at Wisley, that on the second day being in each case a repetition of that given on the first.

March 4–5. Seed Sowing and Vegetative Propagation of Alpines. (Commencing at 2 P.M.)

March 18–19. Pests and Diseases of Fruit Trees; Recognition and Methods of Control. (Commencing at 2 P.M.)

Rhododendron Competition—This year, in addition to the Rhododendron Show on May 5 and 6 there will be a Rhododendron Competition at the Fortnightly Show on March 24 and 25. The Schedule may be obtained from the Secretary.

Daffodil Competition—The annual Daffodil Competition, intended for those who live in early districts, will be held at the Fortnightly Show on March 24 and 25. For the Schedule, application should be made to the Secretary.

Alpine-house and Rock-garden Plant Competition—At the Fortnightly Show on March 24 and 25 there will be a Competition for alpine-house and rock-garden plants shown by amateurs. Entry forms may be obtained from the Secretary.

Camellia Competition—The annual Camellia Competition will be held in conjunction with the Fortnightly Show on April 7 and 8. The Schedule, which may be obtained from the Secretary, is similar to that for last year's Competition but contains a new class for novices for a Camellia plant in bloom.

Lily Conference—A four-day Conference on Lilies, Fritillaries and Nomocharis will be held from Tuesday, July 7, to Friday, July 10. It is hoped that many Fellows and Associates will find it possible to attend and take part in the Discussions. Those who hope to attend on one or more days are asked to be good enough to notify the Secretary so that adequate arrangements may be made.

The Restaurant at Wisley—The Restaurant in the Gardens will be open at the following times during 1959:

March 23 to October 4 (excluding Good Friday)

Weekdays: 10.30 A.M. to 6 P.M. (or sunset, whichever is the earlier).
Sundays: 2 P.M. to 5.30 P.M. (to last Sunday in September).
2 P.M. to 4.30 P.M. (Sunday, October 4).

The restaurant will provide a cafeteria service of cold lunches (weekdays only), sandwiches, cakes, tea, coffee and other light refreshments. There will also be a waitress service for hot lunches on weekdays. The restaurant is licensed for the service of alcoholic refreshments with meals.

Reservations for teas for large parties only may be made for Mondays (excluding Bank Holidays) to Fridays. Organizers should make arrangements, not with the Society, but direct with the caterer, Mrs. D. Badcock, The Oak Cottage Restaurant and Guest House, Shere, nr. Guildford, Surrey (Tel. Shere 168).

Picnicking is not allowed in the Gardens.

International Orchid Conference, 1960—The Third World Orchid Conference, which is being sponsored jointly by the American Orchid Society, the British Orchid Growers' Association, and The Royal Horticultural Society, will be held in London in 1960. The first Conference was held in St. Louis, Missouri, U.S.A., in 1954 and the second in Hawaii in 1957.

The exhibition of orchids arranged in connexion with the Conference will be staged at Chelsea Show on Tuesday, Wednesday, Thursday and Friday, May 24–27, and the Conference will be held in the following week on Monday, Tuesday, Wednesday and Thursday, May 30 and 31 and June 1 and 2. It will be followed by excursions to leading orchid growers' establishments on Friday, Saturday and Sunday, June 3, 4 and 5.

A joint Committee of the three sponsoring bodies is arranging a comprehensive programme covering a wide range of subjects of interest to amateur and professional orchid growers, and well-known authorities from many countries are being invited to deliver papers on the subjects in which they have specialized.

All who are interested, and would like to have further particulars in due course, are asked to notify The Secretary, The Third World Orchid Conference, c/o The Royal Horticultural Society, Vincent Square, London, S.W.1.

Les Floralies Internationales de Paris—A great International flower show, sponsored by the Municipal Council of Paris and the National Horticultural Society of France will be held in Paris from April 24 to May 3 in a large, new exhibition building at the Place de la Défense. Arrangements are in train for the United Kingdom to be represented by three co-operative displays. For further information,

including hours of opening and charges for admission, application should be made to the Secretary, Floralies Internationales de Paris, 84 Rue de Grenelle, Paris 7.

Gardens at Daily Mail Ideal Home Exhibition—This annual Exhibition will be held at Olympia in 1959 from March 3 to March 30. As usual the Gardens laid out in the Annexe of the Grand Hall will be one of the most attractive features of the Exhibition. Fellows and Associates visiting the Ideal Home Exhibition may obtain admission to the Gardens Annexe, without further payment, on any day from 10 A.M. to 1 P.M. on production of their R.H.S. tickets.

Gardens open to the Public—The List of Gardens in England and Wales opening to the public under the National Gardens Scheme in 1959 may be obtained from The Organizing Secretary, National Gardens Scheme, 57 Lower Belgrave Street, London, S.W.1, price 2*s.* 0*d.*; by post 2*s.* 6*d.*

NOTES FROM WISLEY

N. K. Gould

A CHANCE reference to one of the standard English dictionaries recently elicited the rather surprising information that Spring is the "season in which vegetation begins . . . (esp. from about March 21 to June 22)". Taken literally this statement is misleading, for vegetation is continuous rather than periodic.

In our temperate climate most hardy plants rest from active aerial growth for part of the year, although their underground organs may not be completely inert during that time. Nor does the loss of leaves mean that activity within the leafless stem is at a standstill. Preparation for the sudden flowering of a plum tree, for example, has been in progress within the buds long before the event; and the rapid upward thrust of the daffodils during March is but the culmination of nearly two years' steady development of leaves and flowers from a microscopic speck of tissue at the heart of the bulb.

The resumption of active growth following a period of quiescence need not necessarily occur in Spring. Many of our favourite bulbous plants like to sleep through the summer, bestirring themselves again as the days shorten. No better examples can be given than *Cyclamen neapolitanum*, which only shows itself above ground between August and April, and *Narcissus panizzianus*, an Italian species of the Tazetta alliance, which in the half-hardy house at Wisley always flowers in October, six months in advance of most of its kind. Looking round the garden in November, one can find the fresh green foliage of certain species of crocus and grape hyacinth, poppy anemones, snake's-head iris and other less familiar plants. It might be argued that such untimely

growth was the result of incomplete acclimatization of the exotic plants named as examples. Some common wild plants, however, show signs of renewed growth long before the vernal equinox, clusters of young leaves appearing along the shoots of elder and honeysuckle, and the verdant sprouts of wild arum, mercury and hedge-parsley dappling the hedgerows even during the shortest winter days.

The great majority of hardy plants do, of course, respond strongly to the coming of Spring, and towards the end of March there is plenty of evidence of this impulse to put forth new leaves and flowers. Although the wind may be cold the sun's power is gradually increasing, and there is usually a spell of bright and warm weather during the second half of the month to hasten the blossoming of many shrubs and bulbous plants.

Camellias form the most prominent feature at Wisley at the present time. Since the war an enormous number, representing a wide range of varieties, have been propagated and planted in different parts of the gardens, to supplement the small collection in the wild garden, of which most were planted over half a century ago. The restoration of this group of plants to popular favour has been a salient feature of post-war horticulture. In the R.H.S. Journal Index and List of Awards the entries relating to camellias, covering the years 1946 to 1955, occupy virtually the same space as those for the period 1838 to 1935. Thirty-eight awards are recorded for the first hundred years, and twenty-five for the last ten years, covered by the index.

The hardiness and free-flowering character of many camellias would account for their present popularity with the general gardening public, especially as no other group of plants produces such showy flowers in the open air at this time of the year. They also make superb pot-plants for the unheated greenhouse, blooming from October onwards.

Unless there has been severe frost to spoil the buds, there will be a wonderful show of camellias on Battleston Hill, in the wild garden and in the second glasshouse, including varieties of *C. japonica* raised both in this country and in the U.S.A., forms of the invaluable hybrid *C. williamsii*, the early and variable *C. saluenensis* and varieties of *C. reticulata*, unfortunately not hardy enough for the open air at Wisley.

During a mild spell the visitor may expect to find in flower three of the most handsome of the early-flowering rhododendrons, namely, *R. calophytum*, *R. sutchuenense* and *R. praevernum*. These all belong to the Series Fortunei, and are alike in having bold trusses of large white or pale rose-tinted flowers supported by numerous shapely leaves. These are essentially plants for the large woodland garden, where their widely-spreading habit need not be restricted. The rose-pink form of *R. arboreum* is fairly reliable, its cheerful posies of blossom displaying a shade of colour which is not very common at this time of year. The very old hybrid 'Nobleanum', raised in 1835 from a cross between *R. arboreum* and *R. caucasicum*, is of similar colour and the very showy 'Christmas Cheer', another *R. caucasicum* hybrid, does not fulfil the promise of its name in the Wisley climate, but in fair weather at almost

any date during the first quarter it provides plenty of blush-pink flowers which are admirable for cutting.

Some of the more modern hybrids, now available, are excellent plants of moderate size and compact growth appropriate to gardens of limited size and they have the merit of beginning to flower while they are still young.

'Tessa', bred from 'Praecox' pollinated by *R. moupinense*, reproduces the warm rosy purple of the seed-parent in a larger, azalea-like flower. Both this and its sister-seedling, 'Roza', have won awards. *R. moupinense* has proved equally effective as a pollen-parent in its union with *R. ciliatum*, which produced 'Cilpinense', and with *R. leucaspis*, whence came 'Bric-à-Brac'. The three species involved all carry the four-star merit rating in the Rhododendron Handbook, an indication of excellence, and it is not surprising that their children should be outstanding. The oldest plants of 'Cilpinense' at Wisley are now over 6 feet tall, domed bushes covered with bright, elliptic leaves not much over 3 inches long, and each shoot-tip crowned with two or three funnel-shaped white flowers more or less heavily suffused and spotted with rose. 'Bric-à-Brac' is much lower and more compact, and has smaller, paler leaves and flattish white flowers with prominent dark anthers. It is well placed in the rock garden at the north side of a rocky mound.

In addition to camellias and rhododendrons, many other shrubs will be flowering now. In the mild weather of the New Year the winter-sweet (*Chimonanthus praecox*), Chinese witch hazel (*Hamamelis mollis*) and *Mahonia lomariifolia* were unusually fine.

Two berried shrubs of particular value at the same time were *Cotoneaster conspicuus* var. *decorus* and *Pyracantha angustifolia*, whose great merit is that they retain their fruits long after others have been stripped by the birds. The best specimen of the former grows on the bank at the south end of the Trials House, and its arching stems are sometimes wreathed with holly-like berries from September to March. The pyracantha differs from others of its genus in its narrow, tomentose leaves and berries passing very gradually from green to yellow and finishing in a warm orange hue. This is a good wall shrub, but its vigorous growths should be trained in before they become too hard, otherwise their spiny side-shoots make this an unpleasant task.

The hardy species of *Pieris*, namely, *P. japonica*, *P. taiwanensis* and their American cousin, *P. floribunda*, coming a little later, are all most reliable and never fail to give a good account of themselves, producing myriads of tiny white bells; but unfortunately the Chinese *P. forrestii*, so spectacular in the great gardens of Sussex and Cornwall when covered with sprays of crimson young leaves, is not a great success with us.

The forsythias are the brightest of all garden plants during March. Those most commonly seen in gardens are *F. suspensa*, which becomes pendulous with age and can usually be recognized by its broad and coarsely-toothed leaves, simple on the twigs and often three-parted on the shoots, and *F.* × *intermedia*, a hybrid group of stiffer habit and nar-

rower leaves. *F. intermedia* var. *spectabilis* is the most rewarding of all, covering itself with rich yellow blossom year after year if given a fairly thorough thinning and trimming after flowering. The variety named 'Lynwood' is a large-flowered bud-sport of this. *F. suspensa* var. *atrocaulis*, collected by E. H. WILSON in Hupeh, has very large, broad-petalled sulphur-yellow flowers on dark stems, and is at its best in mid-April.

Eight or nine years ago we received from the Arnold Arboretum two polyploid forsythias raised there. One of these, named 'Arnold Giant', a robust plant with large flowers on thick stems, is very showy but not everyone would consider increase in size an improvement in this genus. The second, 'Arnold Dwarf', makes a low, compact and twiggy bush producing pale, starry flowers very sparingly.

Abeliophyllum distichum, introduced from Korea well over thirty years ago, has never become common, but it is well worth planting near a sunny wall, where it will form a spreading, thin-stemmed bush with white or pink-flushed fragrant flowers like small forsythias, in February and March. At Wisley it is trained against the frame-yard wall, but an alternative treatment is to cut it back hard after flowering, thus encouraging it to develop much stronger growths.

Visitors to Wisley this month should not fail to look around Seven Acres, where the heath garden is gay with the later varieties of *Erica carnea*, soon followed by *E. mediterranea* and *E. veitchii*. The long-lasting flowers of *Narcissus cyclamineus*, naturalized in many places in the wild garden, can be seen in their hundreds, associated with *Crocus tomasinianus*, *Chionodoxa luciliae* and other early bulbs. The Alpine meadow will be dappled with the blooms of *Narcissus bulbocodium*, which spreads rapidly by means of self-sown seeds so long as the turf in which it grows remains undisturbed. Many interesting plants will be in flower in the Alpine House now, including saxifrages, primulas and various bulbous species.

MASTERS MEMORIAL LECTURE, 1958

THE LIVING TREE

F. R. Tubbs, M.Sc., Ph.D.

(*Lecture given on October* 14, 1958; MR. J. S. L. GILMOUR, V.M.H., *in the Chair*)

PART I

THE CHAIRMAN: Masters was a very well known amateur horticulturist of the last century. He was Editor of the *Gardeners' Chronicle* for a great many years, and was an expert on various groups of plants. When he died, he left a bequest to establish these lectures on subjects connected

with the scientific aspects of horticulture. In that respect we certainly could not have a better exponent than DR. TUBBS.

Most of you know that DR. TUBBS is Director of the Experimental Station at East Malling (probably the largest in the world) dealing with all types of research on fruit.

He has chosen as his subject "The Living Tree", which is a very appropriate one for a Director of East Malling, for I do not suppose any other director of any other horticultural research station is surrounded by quite so many living trees as is the Director of East Malling.

DR. F. R. TUBBS: MR. GILMOUR has told you the history of the Masters Lectures, thereby much more adequately and more ably covering my first two paragraphs.

The privilege of delivering the Masters Lectures to The Royal Horticultural Society this year is one which I greatly appreciate. The Masters Lectures are designed to cover fields of deep interest alike to the lover of the plants of our gardens, fields, and forests on the one hand, and, on the other, to the botanist who, despite all those limitations imposed by specialization in research, attempts to comprehend the wide principles and mechanisms of plant growth and organization. This increasing specialization in research inevitably results in the development of something of a gap in speech, mental approach, and experience, between the gardener and the plant physiologist. The danger is that this gap may become overwide as the biological sciences advance in complexity.

Great advances have been made in all these sciences since these Lectures were inaugurated in 1908; an increasing importance therefore attaches to occasions such as those provided by the Masters Lectures, by the Amos Memorial Lectures at East Malling, and so on, when both horticulturist and scientist can pause in unison to "consider the lilies of the field, how they grow". The phrase has its own especial beauty and meaning; we are not enjoined to study either growth, or lilies, alone; rather, to consider the lilies as they grow, and then, in humility, to wonder.

Such a line of thought will immediately convey the sense of inadequacy with which I attempt to sketch, however disjointedly, some outlines of our knowledge of tree form and growth. The Masters Lecture of my illustrious predecessor, SIR RONALD HATTON, marked a tremendous step forward in our understanding of the fruit tree; you will see how freely I have drawn, not alone on his work, but also on that of many other able workers at East Malling who worked with him or have developed our later studies of the fruit tree.

I am today endeavouring to discuss the form, structure, and growth of our trees in wider terms; to attempt detailed description, however concisely, of the inter-relations, structure, and functions of the many organs and tissues of such complex organisms would have required not two lectures, but twenty! Instead, I have chosen the interrelations of root and shoot to provide illustrations of the essential unity underlying

so great a diversity of parts and of functions. In the next lecture I hope to pursue this approach, in considering the living tree in relation to its environment, climate, soil, competitors and friends. Meantime, I am deeply indebted to DR. BEAKBANE and MR. PRESTON for their most attractive demonstration of some of the aspects of tree growth we shall discuss.

The tree form is found among gymnosperms, e.g. the cycads, pines, and firs, and among angiosperms both dicotyledons (broad-leaved trees) and monocotyledons (palms, etc.). A tree has been defined as "a perennial woody plant with an evident trunk". So broad a term is obviously one of convenience; we know of tree-like groundsels and ferns and of tropical figs which start as creepers and epiphytes and end as large and imposing trees; on the other hand it excludes the creeping willows of sub-arctic zones and the remarkable *Welwitschia* of the South African deserts which lives throughout its considerable life by virtue of its two seed leaves alone. Then, too, there are all the many transitional forms between shrub and tree. Nevertheless, the word "tree" suggests to us basically precise attributes: long life, woody structure, a distinct trunk basic to an often characteristic branch arrangement, and, in general, considerable size. Though basically simple, these characteristics (especially of form) are essentially plastic in that the tree we see is moulded, firstly, by the recombination in seedlings of inherited characters, secondly, by the environment of the tree past as well as present, and, thirdly, by you and me through the medium of our cultural operations.

The influence of some of the external factors of environment and culture can more conveniently be considered during the second lecture; today, we confine ourselves to a series of all too brief glances at some of the many intriguing characteristics of the tree as an organism.

At this moment, the image in the minds of most, if not all, of you is of a massive trunk bearing branches, leaves, and perhaps flowers. The root, of course, is as integral a part of the tree as its trunk and branches, although less easily studied, but the idea that a tree's taproot is a mirror image of the trunk, like a glorified bean seedling, has no basis in fact. Pictures of complete trees are few; outstanding examples are those provided by ROGERS and his co-workers on fruit trees at East Malling (Fig. 28).

The root systems of these fruit trees are, of course, derived from clonal stool beds, and the compound tree includes a small, and relatively quite unimportant, portion of the rootstock stem. Nevertheless, they provide, in most pleasing detail, satisfactory examples of what is known, in cruder outline, about the roots of established forest and garden trees in which the root system may be that of the plant itself or derived from some seedling of unknown provenance.

Fig. 28 illustrates some of the ways in which the form of a tree expresses the influence of environmental factors: *the top* is affected by such influences as negative geotropism drawing it upwards, competition for light drawing it upwards and outwards, and incidental factors (such as the prevailing wind, exposure, the bending moment of the fruit, or

cultural operations such as pruning) influencing the stance of individual branches to an extent sufficient to affect the whole outline of the tree; in the case of *the root*, the initially simple picture exemplified by, say, an oak or horse-chestnut seedling, of a baby taproot crowned by a chaplet of tiny laterals, is speedily altered out of all recognition by environment. The form of the root system becomes, at an early stage of development, a reflection of the very considerable variation in local environments encountered by the rootlets as they develop and extend. Laterals exploring regions of more favourable nutrition, oxygen supply and moisture, develop vigorously, their branchlets, in turn exploring a vertical wormcast or exploiting the channel opened up by some dead and gone predecessor or the fertile soil accumulated in some fissure of subsoil or rock, will develop markedly into "sinker" roots such as may be found exposed on any quarry site. Similarly, stones, compacted soil, waterlogging, poverty, unfavourable acidity or the competition of pre-established roots of other species may restrict the local development of the root frame in particular areas. Thus a large tree, on a soil whose effective depth is limited by such causes, may be dependent on a shallow and horizontally extended root system.

In such cases as these, the stability of the tree becomes especially dependent upon the strength and position of the main lateral roots. Where these are strong and arise high, near the collar, as in certain selected mazzard and apple rootstocks, the tree is stable under high wind, or as we term it, "well anchored".

The fortunate plasticity in form and development of both branch and root systems, without which many of our cultural operations would be of little avail, accompanies but only partly obscures a basic form and structure characteristic of the particular species or variety we may be considering, in which we cannot consider shoot without root, or root without shoot. A graphic illustration of this is found in the demonstrable organic connection between roots and lateral branches as shown by ROACH, though such connecting strands may bifurcate and thereby may also pass to other branches in the crown. The extent of such cross-connections is influenced by the number, succession, and closeness with which branches are produced; thus in old tea bushes, which have suffered repeated and heavy cutting back at intervals of two to four years throughout their history, the strands of vessels in direct connection with given lateral roots, as traced by dyes, are far more widely dispersed and interlacing than in a young, unpruned tree. These linkages between root and branch are not reflected in overall form; indeed, trees within a single clone or species, despite often characteristic root systems, may vary greatly in the size, strength and especially position of the main lateral roots.

We have only to consider the vast number of growing points in active growth every year in both crown and root systems in relation to the basically "simple" structure that develops to realize that extremely efficient and closely co-ordinated regulatory mechanisms must be in

action. Initially the form of the aerial parts of a tree is largely determined by the relative or absolute suppression, probably through mechanisms affecting the supply of auxins and of materials for cell formation and metabolism, of the growth of lateral buds in the presence of active apical meristems. The degree of this control varies in different parts of the tree, but alone, efficient as it is, it would be insufficient. In most trees a considerable proportion of the laterals on the trunk, and on extending main branches, sooner or later become suppressed, die, and are finally cast off. The extent of this process can be realized by peering into an old hedge of *Lonicera nitida* whose dead laterals persist as a dense mass inside the outer layer of growing shoots. Such suppression of laterals, often of considerable size, is constantly occurring in free-growing trees as well as in hedges, especially in the latter part of hot dry summers; it is probably the latter characteristic that has led to the saying that such shedding foreshadows a "seed year". Indeed, in the oak, regular abscission layers form between successive annual shoots, thus aiding the shedding of unwanted branches.

WIESNER has given data illustrating the importance of the tree's regulatory mechanism and of the additional effects of reduction in the amount and intensity of light in determining the extent of suppression of lateral growth and, thereby, the initial form of the tree. He pointed out that if a ten-year-old twig each year produced and retained but two laterals, 19,683 (3^9) growing twiglets would then be present! (If it had retained four laterals annually the number would have been nearly two million!) Instead, he found on a well-exposed ten-year-old birch branch only 238 laterals, and on another, in greater shade, only 182.

The characteristic trunk of the tree form can arise in a variety of ways; in the palms, etc., there is normally but one apical vegetative bud, the inflorescences being lateral. In conifers and broad-leaved trees the trunk arises from the dominance of either, as in pines, fir, and larch, a single elongating axis or, as in most broad-leaved trees, a succession of shoots each of which maintains vertical growth. In both groups this dominance of the central leader sooner or later becomes limited and finally lost in the development of the crown branches. The stage at which this occurs is often characteristic; equally so is the angle the main crown branches form with the vertical; the three commonly planted *Cedrus* species provide an excellent example. Such major differences in form are accompanied by many lesser ones, arising out of the growth characteristics and continuity of the terminal buds. We cannot, however, regard tree form as the mere resultant of competition, dominance, and suppression among leaders and lateral branches alone, for, as we shall see later, the root is constantly playing its major, but unobtrusive, part.

Closely connected in our mind's eye with the form of a tree is its size. While anything over 20 feet high can, on the authority of WILLIS, be called a tree, records exist of *Eucalyptus amygdalina* of 155 metres (490 feet) from Australia, surpassing even the *Sequoiadendron giganteum*

of California (102 metres) (320 feet). Too often, our ideas on the potential size and longevity of given species of trees are confused by the intruding effects of disease or damage related to the strength of the timber, to the liability to infection of open wounds, or to the mode of branch abscission. Undoubtedly, apart from accident or damage, abscission of unwanted laterals before they become too large ("self-cleaning") accompanied by those considerable annual increments in girth which result in rapid over-growth (or so-called "healing") of snags and wounds, together with wood resistant to rotting, are characters of major importance in enabling trees to reach great age and, perhaps, great size.

The age of the largest sequoias is about 1,500 years, rivalled in the records only by the pedunculate oak (1,500 years), the lime (800–1,000 years), and the common juniper (500–2,000 years), though all these in turn are overshadowed by that yew which was credited with the rather speculative age of 3,000 years. In contrast, shorter lives of from one to two hundred years are attributed to birch and poplar, while others, such as elder, are probably even shorter lived.

Final size is related not alone to the age at which maturity is reached, but also to annual increment; this is closely related to the frequency, duration, and intensity of periods of active extension growth. Thus recent work by MAGGS has drawn attention to the importance, other things being equal, of factors which extend the length of the growing season, while GREGORY and his co-workers have shown the importance of variety, as well as of nutrition, in influencing the area and efficiency of the leaf-surface retained on the tree until the onset of winter. More generally speaking, in young and actively growing trees, the annual increase in height is greatly influenced by the amount of extension growth occurring after the normal pause in root and shoot growth towards the middle or end of July. The size of the crop of seed or fruit and the severity of the summer water deficit are examples that may well affect the amount of late-summer growth: this often varies surprisingly in trees apparently similar in other respects, emphasizing the fact that rapid growth is not alone dependent on external conditions; internal factors such as the physiological condition of the apical bud and the amount or availability of accumulated reserve materials may well be of critical importance. In general, the "rapid growers" among our trees are distinguished by the attainment, relatively very early in life, of maximal annual increments in height. Both rapid growers, like the poplar and alder, and slow, like the oak, make big trees, but a poplar may make 6 feet of growth in its second year, or an alder 5½ feet in its third year, figures far exceeding anything ever achieved by the oak, even at twenty or thirty years of age. (In parenthesis, we may note in the context of total annual growth, that the timing and duration of the periods of active growth may be quite independent of the mere presence of leaves on the tree, though not of their assimilatory efficiency. Evergreens such as holly are, of course, outstanding examples of this.)

With the development of form and size of the trunk and branch system we must also associate that of the roots. Probably at no time does growth, as indicated by cell division, *utterly* cease in the tree as a whole, but in the root visible growth occurs over longer periods than in the top, although the time of budbreak in the spring is markedly characteristic of the scion rather than of the rootstock in compound trees. (Fig. 29).

Root extension is, of course, accompanied by branching, far more profuse than normally realized, probably because of the ephemeral nature of the finer roots. For example, it is recorded that on a piece of root just over one inch long from a one-year-old beech seedling 136 lateral rootlets were found. The importance of this lies in the well-known fact that absorption of water and nutrients takes place, in the main, through the root hairs present along a short length of young root immediately behind the root-tip—here I cannot forbear to interpose a lovely picture of an apple root tip *in situ* from one of DR. ROGERS' papers (Fig. 30).

So active are these root tips that the total length of roots in a young seedling tree may increase tenfold in a year.

Once again, it is clear that the tree must possess an effective mechanism limiting the ultimate effects of such profuse branching. As in the case of the shoot system, a high degree of suppression occurs, fibrous rootlets and even quite larger roots dying off, and leaving vacant volumes of soil which are re-exploited again and again, year after year, by succeeding generations of rootlets. This in time effects local changes in the soil—perhaps physical as well as chemical—sufficiently marked to influence the growth of quite different plants on the same site.

The markedly earlier autumnal ripening and yellowing of mangold leaves is clearly shown on the sites from which 35–40-year-old 'Bramley's Seedling' apples had been removed the year before. We must here remember that the roots are far from mere absorbing organs; of great interest is the effect of exudates from the rootlets in influencing the soil, the microflora inhabiting it, and thereby the supply of nutrients to the tree. For example, ROGERS found, when watching the growth of apple rootlets through glass boxes, that drops of exudate from the root-hairs were frequently visible.

Although considerably influenced by soil conditions, the constancy of relation between the size of the trunk and branches on the one hand and of the root system on the other provides yet another striking example of interrelationships within the tree as an organism. KNIGHT showed that in young apple plants the growth increments of stem and root bear a fixed proportion to one another, and VYVYAN demonstrated the constancy of the shoot/root ratio in apple trees irrespective of age, size of tree or crop. The ratio of the weight of trunk and branches to root weight varies from soil to soil; thus ROGERS and VYVYAN found it to be 2·2 on loam, 2·1 on clay, and only 0·9 on sand.

Just as the form and size of the trunk and branches bear directly upon the efficiency with which the assimilatory organs can be displayed

to light, so the shape and distribution of the root system influences the efficiency with which the soil is exploited; fortunately, as we shall observe in the next lecture, the form, amount, and distribution of the roots can be influenced by soil treatments almost as much as can the top by pruning. Once again, however, we find potent mutual controls at work. Pruning the branches may produce a spurious effect of "invigoration" through the redistribution and concentration into a few shoots of the tree's growth, but its general effect is always to reduce the total overall growth made, not alone by the top, but also by the root; thus pruning results in root systems far smaller than those of unpruned trees (Figs. 31 and 35). That is why the untrimmed edges of your lawn, if I dare suggest they occasionally escape the cutter, are green when the lawn itself is brown with drought.

Earlier on you were shown that on the same M.XVI (late-leafing) rootstock, M.IX buds could be in active growth before the M.XVI buds had begun to break; we could speculate that the amount of seasonal root growth (and therefore the area of active absorbing surface) would be determined jointly by the duration of root growth and by its rate as influenced by local soil conditions. Recent work by RICHARDSON has suggested that the duration of root extension and of root branching is controlled, not *alone* by external conditions, but also by the presence and activity of either leaves or, in early spring before shoot growth is visible, of shoot buds "physiologically non-dormant", i.e. capable of immediate growth once environmental conditions become suitable. In other words, the linkage between the duration of the period of *potential* activity in root and shoot, he suggests, may be much closer than would be supposed on the basis of the periods of obvious and observable growth.

The achievement of such close physiological linkage between the growth potentials of buds and root tips is generally ascribed to auxin mechanisms and to the downward movement of waves of cambial activity initiated in the buds; it is more than a pity that the roots' contribution seems to have received relatively tardy, not to say scanty, attention.

Nevertheless, the auxin mechanisms of the tree may well be influenced by the nature and amount of the organic substances reaching the shoot from the root, or even, it has been suggested, by auxin arising from mycorrhiza; the probability that the root is a potent centre of synthesis and transformation of compounds important to the growth, flowering, and fruiting of the top has opened up a fascinating field of research for the future. Thus we know that inorganic nitrogen is largely combined with organic substances in the roots of apple before it becomes available to the stem; when tomatoes are grafted on tobacco, nicotine passes from the tobacco root to the tomato top (providing thereby, with a little exaggeration, a wonderful "idea" for a botanical "thriller"!); further, it seems that roots may synthesize compounds that, even in extreme dilution, affect the growth and development of cells.

The list of suggestive and exciting facts such as these can easily be

extended—but what really *is* the overall effect of the root system on the growth and behaviour of trunk and branch, flower and leaf? All of us have seen the effects of removing the top, and detailed study of the effects of collar pruning is at least possible, but we are denied knowledge of how the top of a tree would behave if deprived of roots save from the partial indications derivable from the practice of root pruning. Brief but valuable experiments have been made using whole trees rather like twigs that can be cut off and placed in water, but in general our approach to the study of the interrelation of root and shoot must be through the restricted opportunities provided by the fact that trees can be grafted or budded onto seedling or clonal rootstocks of related species, thereby providing root systems of similar, but distinct, physiological character.

The extents to which an apple seedling (and thereby the clonal rootstocks derivable from it) can vary in physiology and anatomy from the scion, while still remaining compatible with it, cannot as yet be stated with certainty. Nevertheless, as HATTON and AMOS showed so clearly, even within the range of thoroughly compatible varieties, rootstock effects upon the scion and scion effects upon the rootstock can occur of such magnitude as clearly to demonstrate the enormous part played by the root in determining what we see and know as an apple, a plum, or a pear; we may, with confidence, hope that similar evidence will one day be forthcoming as to rootstock effects in many more species of trees.

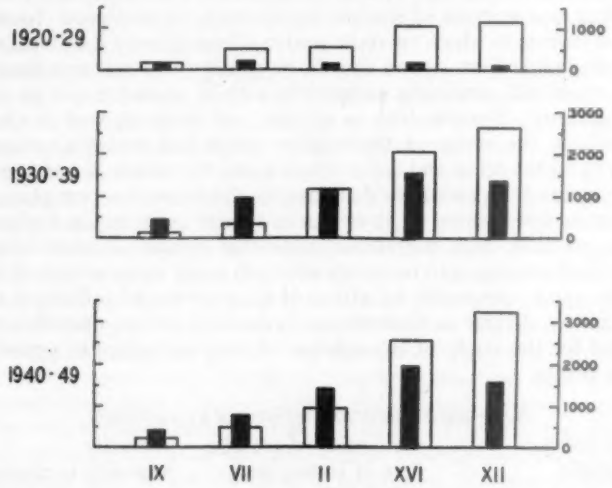
The apple rootstocks, by virtue of their profound influences upon characters so diverse as those shown in the table below, provide unique material for the study of the relation of root and shoot in genetically similar plants.

Some scion characters influenced by rootstock

branch habit	periodicity of growth	precocity
tree weight	date of leafing and leaf-fall	precocity in relation to pruning system
cross-section of trunk	leaf size and number	date of flowering
ratio $\frac{\text{tree weight}}{\text{trunk area}}$	carbohydrate storage	percentage flowers setting
ratio $\frac{\text{branch weight}}{\text{trunk weight}}$	carbohydrate level in leaves	number and weight of fruit
total wood growth	susceptibility to spray damage	fruit size, colour and quality
height and spread	periodicity of mineral uptake	crop/tree size
drought resistance	——	date of ripening
susceptibility to mineral deficiencies	——	storage characteristics
nutritional requirements	——	chemical composition of fruit
water requirements	——	resistance of fruit to fungal infection

As HATTON pointed out in the Masters Lecture of 1929, not only tree size, but also fruitfulness and precocity of cropping, are profoundly influenced by interaction of the rootstock with the branch system. In fact, there is scarcely an aspect of shoot growth, flower or fruit formation which is uninfluenced, either indirectly or directly, by the rootstock.

Text Fig. 1 illustrates the effects upon a single scion variety, 'Lane's Prince Albert', of five clonal rootstocks, varying from the dwarfing M.IX to the vigorous M.XII. Let us note that effects of such magnitude and constancy over decades can occur without any indication of ill health in the branch system or of incompatibility between rootstock and scion



TEXT FIG. 1—The effect of rootstock upon vegetative growth and fruitfulness of 'Lane's Prince Albert 'apple planted January 1920. White oblongs show wood growth in metres, black oblongs show weight of crop in pounds.

variety. Further, rootstocks can act not only by dwarfing or limiting the inherent vigour of the scion, but also, if inherently more vigorous, by *increasing* the size of the top above the normal. Again, if an established tree controlled in size and growth by the rootstock is inarched with a more vigorous rootstock, it responds by steadily becoming more vigorous, on the sides where the inarched vigorous rootstock is attached, until the latter becomes the dominant partner.

Not only the size, but also the *form* of the tree is greatly influenced by the root. For example, even though the growth of an apple in its maiden year on the dwarfing M.IX rootstock may equal or exceed that on a more vigorous rootstock or on its own roots, the early and relatively profuse formation of spur shoots, accompanied by reduction in extension growth and weighing down of laterals by the fruiting that results

from the precocity induced by the M.IX rootstock, leads to a characteristically sparse branch formation and early loss of dominance by the more central branches (Fig. 32).

Even more striking effects are shown by pears. The form of a 'Conference' or 'Comice' on quince roots is well known to you. Allow but one major root of the pear's *own* tissues to develop and forthwith the whole character of the tree changes; vigorous extension growth, increased dominance of the central branches, thorn shoot formation, reduced flowering, and altered characters of the fruit all follow.

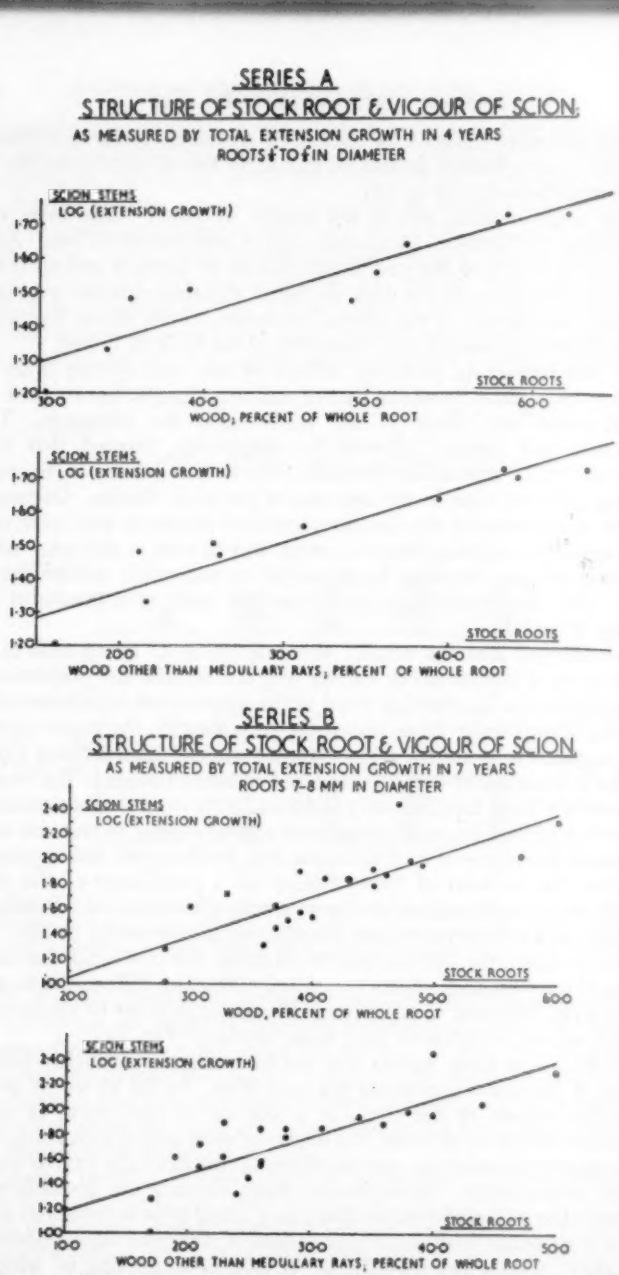
To this picture of profound effects of the root system upon the branch system must be added that of definite, though less marked and less all-pervading, effects of the scion upon the rootstock. Thus THOMPSON and MOSSE, followed by MACKENZIE, showed that there occurred mutual interaction between rootstock and scion to an extent that was reflected even in the anatomy of the scion tissues. Of greatest interest in this respect was the interaction of rootstock and scion upon the proportions of living tissue in stem and in root, a character whose great importance, whether fundamental or indicative we do not yet know. This first became apparent from the work of BEAKBANE at East Malling (Fig. 33).

She showed that the smaller the proportion of living cells in the young roots of the rootstock variety and the smaller the proportion of living cells in the functioning wood of the young roots (attributes which vary characteristically from rootstock to rootstock), the more vigorous and less precocious are the scion varieties worked upon it (Text Fig. 2).

The proportion of bark to wood and of living tissues in the wood of the roots has been found to vary independently in apple rootstocks, the proportion of bark to wood being more closely related to tree size as the tree passes the stages of establishment and development and approaches maturity; the amount of living tissues (as a percentage of the whole root) is more nearly related to the precocity (flowering and fruiting) of the scion in its early years and, thereby, to its size earlier in life..

To complete the picture and to illustrate the profound and lasting nature of the rootstock effects associated with these differences in structure, we can compare 'Cox's Orange Pippin' on a range of rootstocks of varying vigour, at thirteen years from working (Fig. 34).

Profound as these effects are, we have also to remember that the vigour of the scion influences the root also. So far as we at present know, the vigour of the stem, in a tree on its own roots, is exactly equivalent to that of its roots, the tissues of stem and of root being of the same genetic constitution and therefore having basically similar physiological potentialities. Nevertheless, there remains the possibility that the mere fact of being root or shoot may affect growth potential or that plants may occur with roots and shoots of different vigour potentials, as, indeed, MAGGS has speculated. If this, or something of which his idea is the foreshadowing, be true, then we could regard stem- or root-suckering as possibly resulting from systems where the root is innately



TEXT FIG. 2—The relation between the anatomical characteristics of certain apple rootstocks and the vigour induced in the scion variety: (*a*) over a period of 4 years (roots ¼–½ inch diameter), (*b*) over a period of 7 years (roots 7–8 mm. diameter).

more vigorous than the top, and the tree form, as we know it, as reflecting the existence of a growth potential in the top in balance with, but dominant over, that of the root.

So far, we have taken for granted that the growth of compatible scions and rootstocks is perfectly co-ordinated and unimpaired throughout the life of the compound tree, as indeed it is. In conclusion, let us glance at what happens when that deeply perfected co-ordination, which we so often take for granted, and of which we have considered so many examples today, breaks down.

Fig. 36 shows an incompatible union, between 'Victoria' and 'Reeve's Seedling' plums, over Myrobalan B rootstock. The bark has been removed, exposing the bridges of normal wood formed where the cambia above and below have grown in coordinated and compatible manner, and the "breakdown of communications" is marked by confused and uncoordinated growth of parenchyma where the cambia fail to integrate in growth. No one, I think, could study this without marvelling at the coordination expressed in each and every tree we see around us.

I cannot end without expressing my personal indebtedness to the many who have helped me, but especially, and far exceeding that arising out of their presence here today, to DR. BEAKBANE and MR. PRESTON for all their help. Before you are the demonstrations they have so kindly prepared of aspects of their work, upon which I have so fully drawn.

THE CHAIRMAN: If I stole DR. TUBBS' thunder a little bit over the history of the Masters Lectures, he certainly did me in the eye over something which I ought to have known, and which adds much to his talk, namely, that his predecessor, SIR RONALD HATTON, gave the Masters Lecture nearly thirty years ago. On that occasion HATTON announced the results of the early work on the Malling rootstocks, which has led to such tremendous results; now, nearly thirty years later, another Director of East Malling gives a Masters Lecture and in part describes the almost incredible development of SIR RONALD HATTON's work begun thirty years ago.

MR. MANN: I used to work at Long Ashton: now I work at the Malaya Rubber Research Institute and am therefore particularly interested in the growing of trees.

I was very much interested indeed in the whole of DR. TUBBS' talk, particularly in the early part, where he showed us the pictures of trees with excavated root systems.

Now, most of the examples he described to us have adventive root systems developed from stocks by the method of stooling. In fact, the root system of your compound tree does not begin as does a seedling root system: there is no tap root. I wonder, were the root system developed from a primary seedling, whether the form of the root system would be so profoundly changed by what happens to the top of the tree, or vice versa.

Possibly others have worked with other crops where the root is derived from a primary seedling.

DR. TUBBS: The point raised by MR. MANN is indeed well justified, but, of course, what I have been showing you are illustrations—the best available to me—of excavated root systems in full. There are not available as far as I know, the fully excavated root systems of large forest and other trees that we would like to have.

Nevertheless, the illustrations available from forestry research and elsewhere all go to show that, in general, the influence of soil environment on the root of seedling trees is indeed very similar to the effects it has on the roots of those trees where the rootstock is raised from layers. Indeed, we must remember that in a very large number of cases the so-called forest tree has no tap root at all. The work of the Forestry Commission would indeed be gravely impeded if all successful transplanting were dependent upon the tap root remaining uninjured in its apical portion!

Many years ago I studied the question in tea, where we were dealing with a seedling population, some of it transplanted as plantation forestry trees would be today, other parts sown as "seed at stake", the large tea seed being sown in the ground and the rootlet allowed to grow *in situ*. Almost invariably the major roots could be found to follow the channels of fertility in the soil and were clearly laterals, not tap roots; particularly where cleared jungle land was used they would develop down the fertile channel left by some rotting root of an earlier forest tree.

I am satisfied that the slides shown illustrate a general state of affairs; at the next lecture I will provide a slide illustrating natural suppression of the tap root in beech.

THE CHAIRMAN: If there are no other contributions, perhaps you would care to gather round the exhibits, and DR. TUBBS and his staff will answer any questions.

A number of Fellows availed themselves of this invitation.

CLIMBERS AND OTHER PLANTS FOR WALLS

G. H. Preston, F.L.S.

(*Royal Botanic Gardens, Kew.*)

(*Lecture given on June* 17, 1958, MR. G. L. PILKINGTON *in the Chair.*)

I WOULD like first to emphasize that the term "climbing" should only be applied strictly to those plants that have means of attachments to support by their natural appendages, i.e. aerial roots as in the ivy, adhesive pads or suckers of the virginian creeper or the twining stems of the honeysuckle. Tendrils, which are in some instances extensions to a leaf, and twining petioles or leaf stems are also natural means for climbing as in the clematis.

But, generally speaking, the word can be used in a very loose way to cover many plants, which, although they have no natural means of

climbing, can by reason of their vigour or habit of growth be adapted as climbers, providing they are given the necessary support; hence we find some plants quite often being grown against a wall, which if allowed to grow naturally would develop into a large shrub or small tree. Therefore I shall deal with many other types of plants, which, although not true climbers, make very suitable subjects to grow against walls of various types.

One cannot overestimate the value of walls for the successful cultivation of these types of plants, for, if well grown, they can form a very effective feature and add considerable interest and beauty to any garden. They also provide more favourable conditions for species which are too tender to be grown in the fully open ground, while they are also useful for improving the growing and flowering qualities of other species, which, although perfectly hardy, flower indifferently or not at all.

Many of these climbing plants can be of considerable use in providing a screen or helping to cover large, bare, unsightly walls from top to bottom, which could not be done so effectively by the use of other types of plants.

An example of this can be seen in the deciduous Virginian creeper, *Parthenocissus tricuspidata* (*Ampelopsis veitchii*), which provides a wonderful display of autumn colour just before leaf-fall, or the various forms of ivy, *Hedera helix*, which have aerial roots or sucker pads for natural means of climbing. The latter, being evergreen, is a typical example of the use they have in providing some sort of colour all the year round and particularly during the dull winter days when it is most appreciated.

However, one must not overlook the fact that occasionally one can see good open walls completely covered with ivy, which is a waste of good opportunities where the planting of more ornamental climbers and other shrubs could be advantageous. It must also be remembered that in large industrial towns and other areas where the atmosphere is so contaminated by soot or sulphurous fumes or hemmed in by tall buildings, the growing of many of these plants becomes impossible especially those that have evergreen foliage.

In town or suburban gardens where the atmosphere is clean, the walls of houses or boundary walls provide ideal positions for climbing and other plants, but here some discretion must be exercised as to the vigour and to the size to which the plant will ultimately grow. In most cases it is not desirable to have climbers growing up too high, as it does cause difficulty when pruning and tying in of new growth which may be necessary from time to time. Overgrowing windows and obscuring the view in the garden, keeping out light, etc., are some of the disadvantages. Also plants with a very strong-growing root system can cause serious damage to the foundations of the house if allowed to go unchecked. Therefore the selection of the right type of plant for the right position is most important.

On the whole, climbers, especially the strong-growing ones, cannot be considered as satisfactory as shrubs for covering walls of moderate

height, in many cases they have a strong tendency to reach the top of the wall and to leave the lower parts bare; sometimes, however, these can be used to train along the top of the wall and leave the lower spaces for shrubs, but, as I have already said, the great value of walls is not in providing accommodation for climbers alone, but in affording conditions that enable many beautiful shrubs to be successfully grown that are tender in the open ground.

Where climbers and other plants are being grown on the ordinary boundary wall, especially where the border of herbaceous plants or vegetables exists in front of them, no new soil or special preparation will be needed, but against the walls of houses or other buildings where the soil is very poor, or maybe a gravelled or paved path is so close that there is little or no space for soil, a considerable amount of preparation is necessary.

A space 1½ to 2 feet wide and as much deep should be made at the base of the wall and filled with good prepared soil where possible, as it is essential to give the plants a good start; once rooted into the new soil they will spread under gravelled or paved walks quite freely. In very heavy soils a certain amount of coarse drainage may be necessary in the bottom of the hole. Where possible incorporate a small amount of well-decayed leaf-mould or peat moss to aerate the soil and so give good quick drainage, which is essential for their successful cultivation.

However, an ideal soil would be a good, light, alluvial loam mixed with a quantity of decayed leaves—providing the soil is free of lime or chalk—this mixture would suit very nearly everything, even the peat-loving plants. After planting has been completed a good mulching round the base of the plant of straw manure or any other well-decayed material from the compost heap is very beneficial in helping to conserve moisture during dry periods.

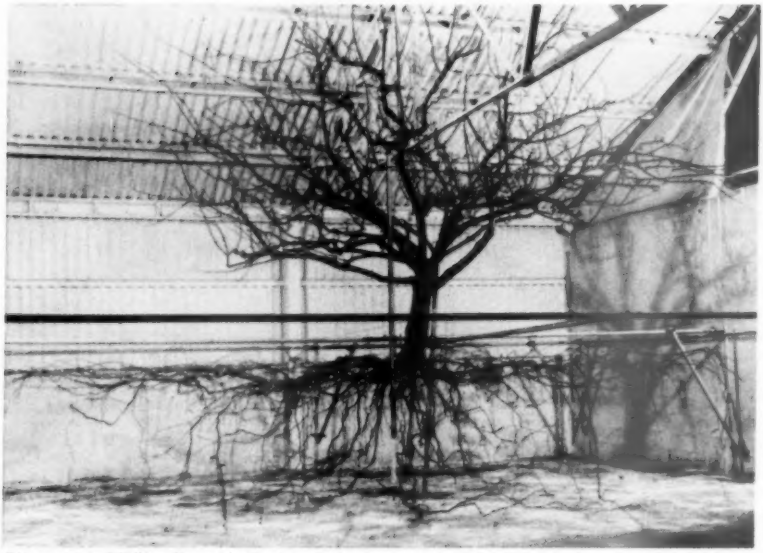
Plants growing against walls, with the exception of a few that prefer shade, succeed best on a wall facing between south and west, although for preference I would choose south, for it is there that the plants get the benefit of the maximum amount of sunshine, while on a west wall the amount of sunshine is usually greater over the yearly average in the afternoons than the mornings. However, there are many plants that will thrive on walls exposed to the east and south-east, although some discretion may be used in selecting those plants that bloom after March or early April which would miss the late spring frosts. Walls facing north are least satisfactory of all, and comparatively few climbers or shrubs prefer them. They are mostly evergreens that do best. Even so, some shelter from north and north-west winds by other vegetation is advantageous; walls fully exposed to these winds especially in cold districts are difficult to furnish with interesting plants.

There are some climbers and shrubs which do not possess natural means of supporting themselves and therefore artificial means have to be given.

One of the commonest methods, especially on brick walls, is to use

Colour photo: J. E. Downward

FIG. 27—*Sorbus matsumurana*. Japanese Mountain Ash. A fine species of Sorbus for autumn colour both of leaves and berries. A.M. 28 October 1958. Exhibited by The Crown Estate Commissioners, The Great Park, Windsor (see p. 142)



Photos: East Malling Research Station

FIG. 28—Apple, 'Cox's Orange Pippin' on rootstock M.II. Sixteen years old. Excavated at Macknade, Faversham, 1951 (see p. 109)

FIG. 29—One-year-old 'Ribston Pippin' apple grafts on the late-leafing M.XVI rootstock (see p. 113)

FIG. 30—Actively growing root-tip of apple *in situ* (see p. 113)

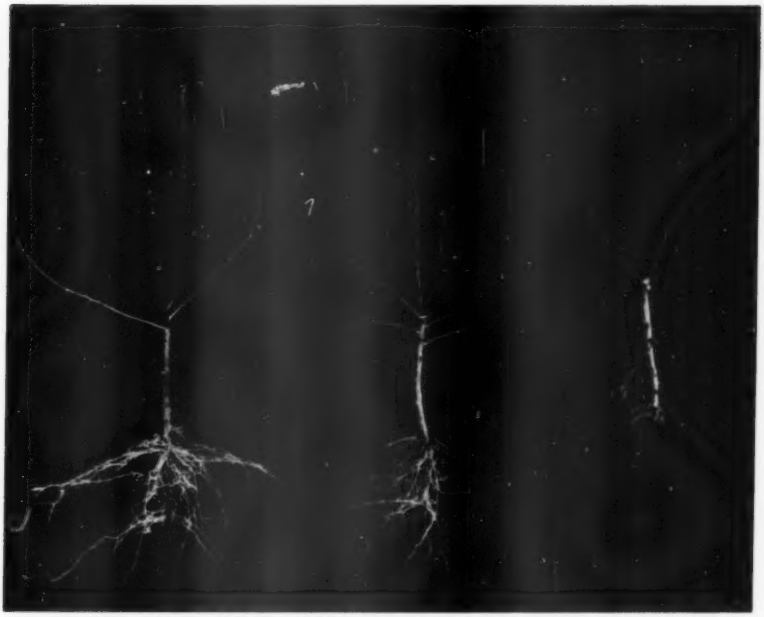


FIG. 31—Branch pruning in relation to root growth; one-year-old M.X (*left*) unpruned at planting; (*centre*) cut half back at planting; (*right*) cut to ground level at planting (see p. 114)

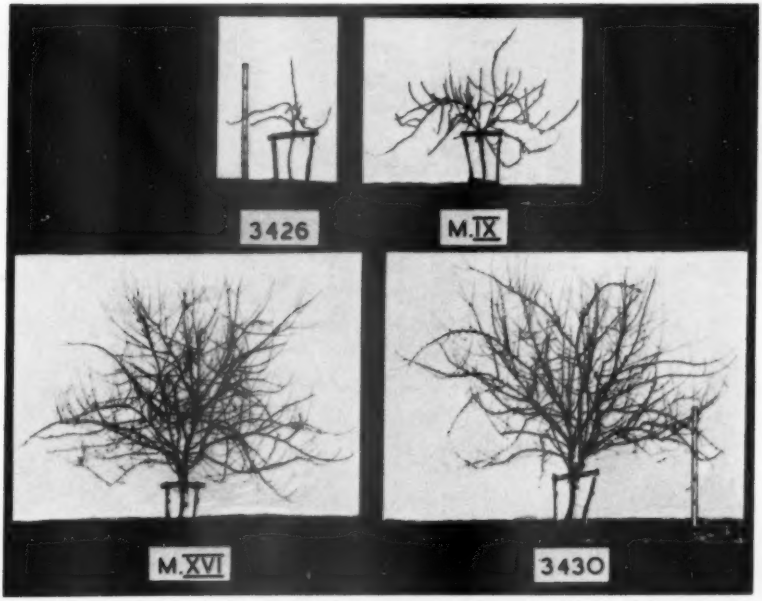


FIG. 32—Apple 'Cox's Orange Pippin' on rootstocks 3426, M.IX, M.XVI, 3430, at eight years after working (see p. 117)

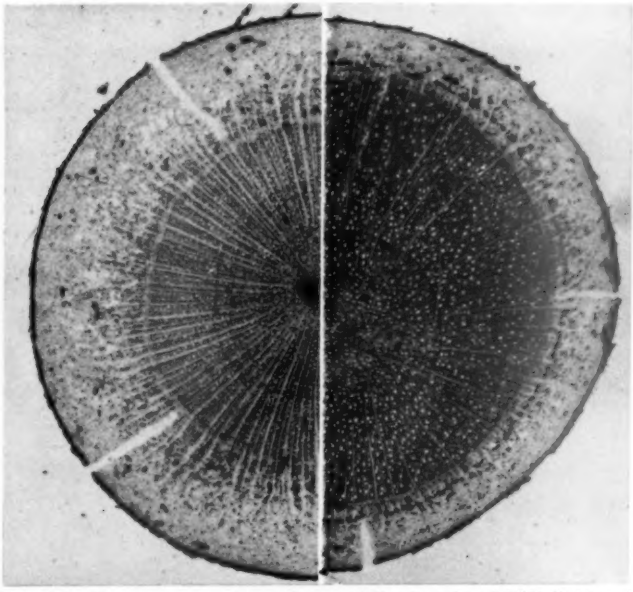


FIG. 33—Transverse sections of root of the dwarfing M.IX (*left*) and the vigorous M.XII (*right*) rootstocks (see p. 117)

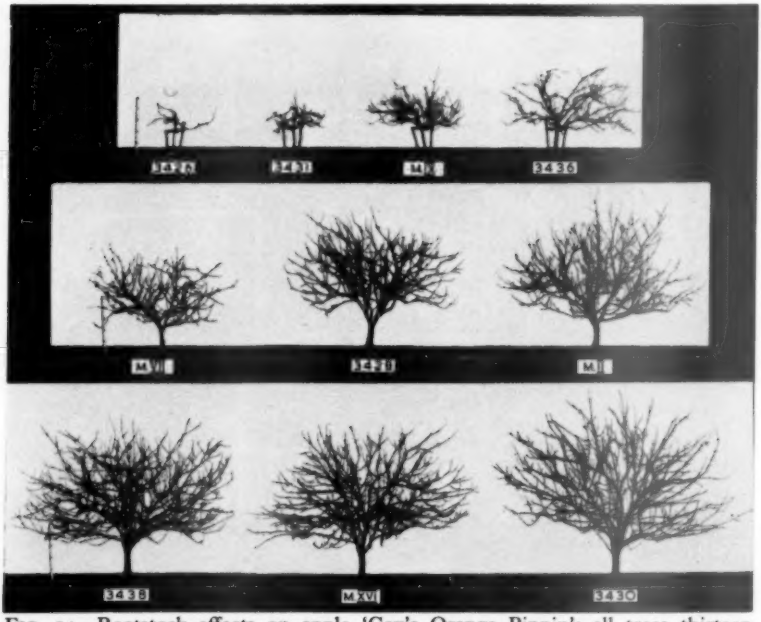


FIG. 34—Rootstock effects on apple 'Cox's Orange Pippin'; all trees thirteen years old and grown adjacent to one another; the only variable factor is the root system varying from very dwarf (3426) to very vigorous (3430) (see p. 117)

FIG. 35—Effect of cutting S23 perennial rye grass to ½ in. as against being allowed to grow unchecked
(see p. 114)

FIG. 36—An incompatible union between 'Victoria' and 'Reeve's Seedling' Plums over Myrobalan B rootstock after removal of the bark. Note the bridges of normal wood elements
(see p. 119)

Colour photos: Valerie Finnis

FIG. 37—*Abutilon megapotamicum* (see p. 132)

FIG. 38—*Clianthus puniceus* (see p. 132)

FIG. 39—*Erythrina crista-galli* at the foot of the wall in the Savill Gardens, Windsor Great Park (see p. 131)

Photo: J. E. Downward

FIG. 40—Winter Aconites, *Eranthis hyemalis* in the garden of Lady C. Bonham Carter at Wyck, near Alton. The display is usually at its best in the middle of February (see p. 139)

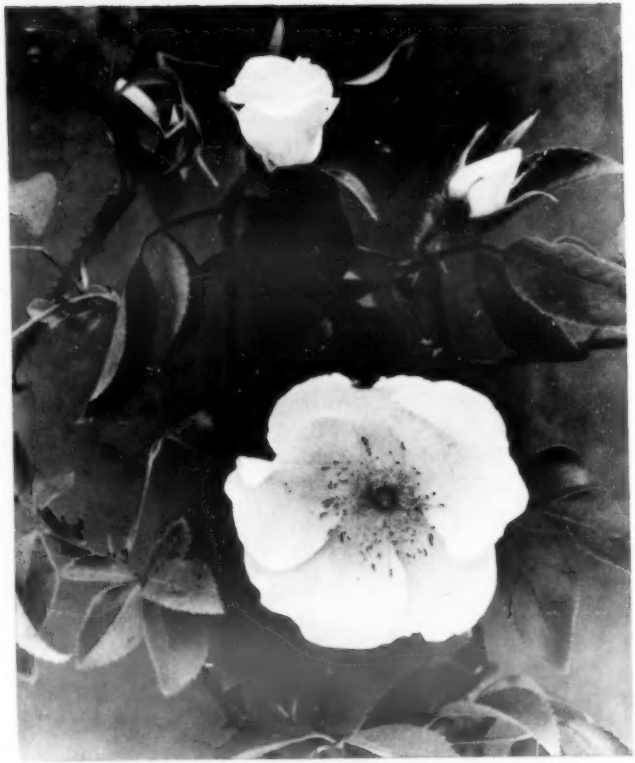


Photo: J. E. Downward

FIG. 41—*Rosa laevigata*. The Cherokee Rose (see p. 124)

Photo: F. G. Preston

FIG. 42—*Ceanothus thyrsiflorus* var *griseus* (see p. 125)

Photo: J. E. Downward

FIG. 43—*Campsis grandiflora* (see p. 126)

Photo: J. E. Downward

FIG. 44—*Solanum crispum* 'Autumnalis'. Often called the 'Glasnevin variety' (see p. 125)

Photo: J. E. Downward

FIG. 45—*Desfontainea spinosa* (see p. 131)

Photo: J. E. Downward

FIG. 46—*Lonicera etrusca* (see p. 130)

Photo: F. G. Preston

FIG. 47—*Wisteria chinensis*. An unusually fine specimen on the wall of Trinity College, Cambridge (see p. 128)

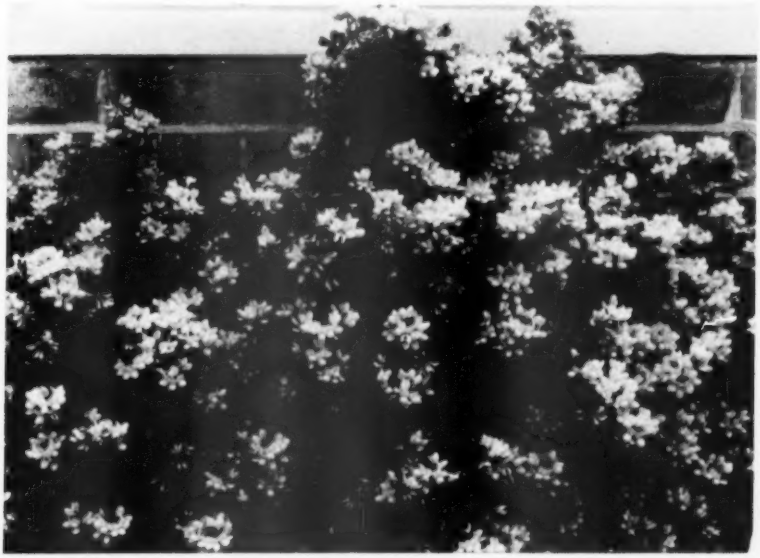


Photo: H. Smith

FIG. 48—*Coronilla glauca* growing against a south wall (see p. 131)

Photo: J. M. Fisher

FIG. 49—The foliage colour border at Hampton Court (see p. 137)

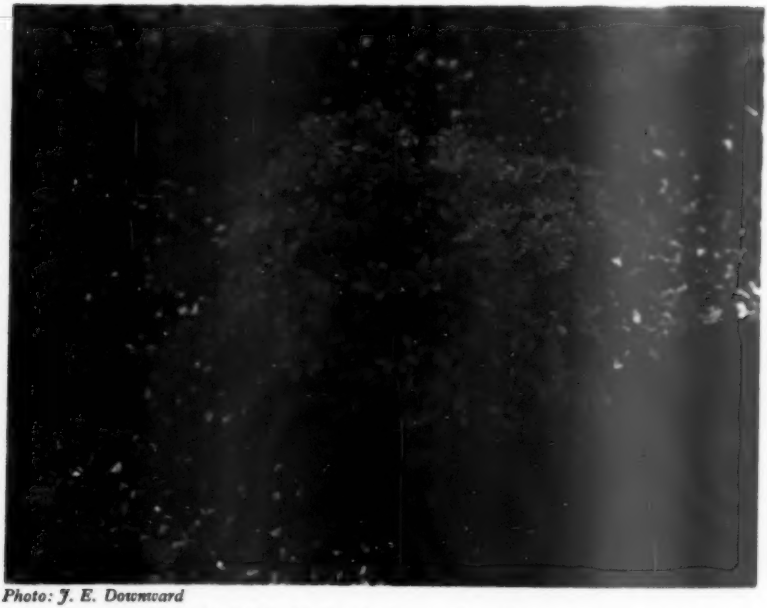


Photo: J. E. Downward

FIG. 50—*Lewisia howellii* 'Weald Rose'. A very fine plant exhibited as part of a group at Chelsea Show 1958 by Mr. A. G. Weeks (see p. 138)

nails, for which a specially stout type is obtainable. Strips of cloth and other strong, lasting material known as shreds can be purchased already cut to size. These are put round the shoot or stem and the two ends of the material nailed to the wall; however, the use of nails on walls of dwelling-houses or other important buildings and walls can be detrimental and is not altogether satisfactory. Quite often during high winds and rains and after heavy snowfalls, the extra weight of the branches will bring the supports, including the nails, from the wall.

In such cases the best and most satisfactory means of support is to string the wall horizontally or, in the case of twining climbers, vertically, with stoutish galvanized wires from 4 to 8 inches apart and held in position by hooked or eyelet-holed metal pins driven into the wall. Use can also be made of strong galvanized hooks.

Other methods of support quite often used are lattice work of narrow laths, painted or creosoted, which are joined together in the form of frames; or equally as effective is the use of wooden trellis work. Both types can be easily fixed to the wall, while a very cheap effective means of support can be obtained by fixing strips of wire-netting, although it may only be of a temporary nature. For dwarf climbers, like lathyrus, and other annual climbers, such as ipomoea, which look very effective planted near the wall, ordinary pea-sticks will suffice.

Many shrubs planted near walls, such as pyracantha, chaenomeles, etc., build up in a few years a very rigid stem and branches strong enough to be self-supporting.

There is no cultivated genus of climbers to equal the clematis, a very useful and extensive race of wall plants which when in flower provide some of the most beautiful effects one could wish for in a garden. The various types provide flower for many months during the summer, starting from June until the end of September, but although they are perfectly hardy the young growth may occasionally be damaged by late spring frosts.

They provide a great variety of colour, particularly in the hybrids of the large-flowered types or groups, ranging from white, various shades of light and dark blue, purple, mauve, red and pink, and constitute by far the best-known, most beautiful and, for the amateur generally, the most important section of the genus, all of which have been derived from such species as *Clematis lanuginosa*, *C. patens*, and *C. coccinea*.

They present no real difficulty as regards cultivation, succeeding in a moist, well-drained, loamy, calcareous soil, although all of them, including many of the species, will thrive quite well in soil which is deficient of lime, but it is advisable if possible to add some to the soil in the form of mortar rubble at planting time. The best time to plant is during the autumn, say October to November; if this is not possible, early spring before new growth commences. Once planted, they should be left undisturbed at the roots, and when established they will continue to grow and flower regularly every year. They are all sun-lovers, but the

lower part of the main stem prefers to be shaded and kept cool at the roots. It is, therefore, advantageous to plant near or at the base of some dwarf shrub which will cast some light shade and allow the clematis to grow up through it.

In view of MR. JACKMAN's paper on clematis recently published in this JOURNAL, it is not my intention to give a long list of varieties and their colours, it is a matter of personal choice and one should consult any good catalogue or, better still, see them when they are in flower and then select one's own colours.

Within the very large family of *Rosaceae* are many beautiful and useful genera of plants well adapted for wall cultivation: of these the rose is one of the most popular. While there are many very charming species, it is the climbing hybrid types of roses which are the most popular for the average garden. The rose has been hybridized and interbred so much that today it has produced many varieties of varying shades of colour and form with a wide diversity of growth and habit. However, we are only concerned with the so-called climbing types, which include the ramblers, climbing hybrid teas and hybrid musks, polyantha and the wichuraiana types, which are most suited for walls.

There are innumerable numbers of good varieties with such a wide range of colours to choose from it would serve little purpose to give a list of the varieties worth growing. In all cases the majority of roses do like a good, well-drained, but retentive soil to grow in. On light or poor soil, it is advisable where possible to take out a large-size hole and put in a quantity of good soil to enable the plant to have a good start. Roses like plenty of light and sun to help ripen the new growth on which many of them flower the following season. While on the subject of roses there are several beautiful species well worth including, such as *Rosa banksiae*, a very old evergreen climber which comes into flower in early summer with lovely pale yellow flowers, borne in clusters on slender branches—there is also a white form as well as the double-flowered forms of both colours. This rose will grow eventually 30 to 40 feet high, making it useful for high walls and very useful for the front of the house where it can be trained up over the doorway and around windows and so forth. The Banksian rose in all its forms is one of the most lovely of all species, but to flower it really well it does need a warm wall where it can get as much sun as possible, a species well adapted for the south of England.

Another rose requiring similar conditions is *Rosa laevigata*, "the Cherokee Rose" with large white, very fragrant flowers—a Chinese climbing species which will reach a height of 15 to 20 feet clinging to its supports by means of hooked spines (Fig. 41). The hybrid *Rose* × *anemonaeflora*, said to be a cross between *laevigata* and some other species, has large lovely pink flowers, and 'Ramona', with large carmine flowers, are both roses which require a south wall if they are to give of their best. Another distinct and remarkable species is *Rosa bracteata*, introduced by LORD MACARTNEY, from whom it takes its name the "Macartney Rose", an evergreen with very attractive glossy green leaves,

shrubby-like in growth, which will reach a height of 10 to 15 feet in favoured districts. The large white solitary flowers, 3 to 4 inches across, start to bloom from June onwards on the current year's growth, making it one of the most striking of all species. This has been the parent of a few good hybrid roses, one in particular, 'Mermaid', is a most beautiful plant for walls, much stronger in growth and hardier than its parent and with large, pale primrose-yellow flowers in sprays which continue to bloom from June until the frost in late autumn.

The genus *Ceanothus*, better known perhaps as the Californian lilac, are mostly evergreen shrubs with flowers of varying shades of blue and purple. They are native to the warm regions of California, Colorado and New Mexico, where they get a tremendous lot of sunshine. Therefore, many of the species thrive best with the shelter of a wall. They prefer a light, well-drained, sandy soil on a wall exposed to the south, but will succeed very well on walls facing west and east. There are several good species worth growing but time only permits me to mention a few. One of the most popular of all is *C. veitchianus*, a low spreading bush, up to 10 feet high, with small round glossy green leaves and dense heads of bright blue flowers during May and June. *C. rigidus* is very distinct, having small glossy, holly-shaped leaves and deep purplish blue flowers borne in great profusion during April and May.

Another very fine early-flowering species, worthy of a place on a wall, is *C. thyrsiflorus*, which by contrast is a stronger growing type with much larger leaves, more rounded in shape and glossy green in colour. The lovely pale blue flowers are borne in clusters on long stalks arising from the leaf axils of the previous season's growth; this is probably one of the hardiest of all the species.

Equally attractive and vigorous is *C. thyrsiflorus* var. *griseus*, having large oval-shaped leaves similar to the type, but dull grey-green on the under-surface; the colour of the flowers is a pale lilac shade and it makes a very beautiful plant when in flower (Fig. 42).

Where space permits on a wall the climbing solanums are well worth planting, although not climbers in the true sense of the word as they have neither tendrils nor twining shoots. They are best described as very vigorous ramblers which require some support to the wall as new growth develops. First is *Solanum crispum*, introduced into gardens from Chile about 1830; when grown at its best it is a most graceful and lovely plant, and quite hardy if given the protection of a south or west wall. It is a very quick grower and more or less evergreen with a loose spreading habit; the flowers are produced very freely during June and July in very large clusters, deep lavender in colour with conspicuous yellow stamens in the centre of each flower, on growth made during the current season. The variety 'Autumnalis', sometimes called the 'Glasnevin Variety', is the best form to grow on account of its longer season of flowering (Fig. 44). On the south wall at Kew it has grown and flowered profusely for many years; a fine specimen is also to be seen on the wall at the Savill Gardens, Windsor.

The other species, *Solanum jasminoides*, also an evergreen, is somewhat more slender in growth and if anything more tender, which is not surprising since it is a native of Brazil. However, it will thrive and flower well if given a warm sheltered position in a light well-drained soil. It flowers from July to September in great profusion, the individual flowers being pale blue in colour and borne in loose clusters. The one most usually cultivated in gardens is the variety *album*.

Next we come to *Campsis*, better known in gardens as *Tecoma*. There are two species grown, *Campsis grandiflora* and *C. radicans*, and both have been in cultivation in this country for many years. They are deciduous and have opposite pinnate leaves. The flowers, which open in August and September, are among the most handsome seen in climbing plants, but to get them to flower well a really hot summer is required. Both are very vigorous and make growth several feet long in a season, but need added support such as tying or nailing to the wall, although in the case of *C. radicans* it is almost self-supporting and will attach itself by means of its aerial roots which are produced from the stem. *C. grandiflora* is probably the finer of the two species, having large trumpet-shaped flowers, 2 to 3 inches long, deep orange red in colour in pendulous panicles of from six to ten produced at the end of the current year's growth (Fig. 43). *Campsis radicans* on the other hand is a much freer-flowering species with scarlet orange tubular-shaped flowers hanging in clusters of four to twelve, flowering as they do at the end of the current season's growth. They can be pruned well back in winter or early spring before growth has started. By crossing the two species a range of hybrids was produced with intermediate characters as showy as *grandiflora*, freer-flowering and hardier. Of these, probably the best is one called 'Madame Galen', having beautiful salmon-red flowers, a most desirable plant.

Another charming plant belonging to the same family *Bignoniaceae* is *Eccremocarpus scaber*, a semi-woody climber, growing 5 to 6 feet high in favourable conditions with slender stems and opposite pinnate leaves bearing tendrils by means of which the plant can support itself. From June onwards long racemes of up to a dozen bright orange tubular-shaped flowers about 1 inch long are forthcoming until late in the summer. It is a very old plant introduced into this country from Chile; not being completely hardy it is, therefore, well suited for growing along a wall facing south or west. In some of the less favourable parts of the country, however, it has a habit of being only of annual duration, but, as it produces plenty of good seed, young seedlings can be raised each year and if sown early in the spring will flower the same season.

Where large wall areas require covering there are several very good subjects one can use to great effect. First, I would suggest *Hydrangea petiolaris*, a very hardy and vigorous grower, which by means of its aerial roots produced from the young stems is able to root closely to the wall in similar fashion to the ivy. The large, white, flattish corymbs of flowers are freely produced in June on short twiggy side growths of the main branches, contrasting well with its large deciduous dark green

leaves which turn a very pleasing shade of pale yellow in late autumn. Being very hardy it can be successfully grown not only in full sun but in other aspects where the amount of sun is greatly reduced. It certainly is a very accommodating climber.

Pilostegia viburnoides (often known as *Schizophragma viburnoides*), a Chinese evergreen climber which will grow anything up to 10 feet or more, is another very useful self-clinging plant which can climb by means of aerial roots in the same way as *Hydrangea petiolaris*, to which it is closely allied. The dull green leathery leaves give a good contrast to the white terminal panicles of flower in late summer, although it is the conspicuous stamens which make the inflorescence so attractive. A good specimen which flowers profusely every year is to be seen at Kew growing on a south wall. Another very remarkable plant is *Actinidia chinensis*, first brought to notice by ROBERT FORTUNE on one of his travels into China; it is well worth growing not only for its flowers but for the large, handsome, heart-shaped leaves on long vigorous twining stems some 10 to 15 feet in length. It can climb if given support. The cup-shaped flowers, white when they first open but changing to buff yellow with age, in the more favoured parts of the country give rise to edible oval-shaped fruits about the size of a walnut. These are often sold in shops under the name of "Chinese gooseberries".

Actinidia kolomikta—another species belonging to the same genus but not so strong in growth, is well worth planting for its large attractive foliage which, when fully developed, has a large part of its leaves variegated with white and pink at the tips; sometimes it is quite half and occasionally the entire leaf will have this variegation.

Another lovely and large genus which should be represented in a collection of wall plants is *Vitis*, commonly called the vine, in which some botanists have included *Ampelopsis*, *Parthenocissus* and *Cissus*. Altogether there are some fifty to sixty species hardy in this country, many of which are very strong deciduous climbers with ornamental foliage which turns a handsome colour in autumn. They climb with the aid of their twining tendrils which attach themselves to whatever support there may be at hand. All of them are very easy to cultivate and grow in any good well-drained soil, in a position where they can obtain the maximum amount of light. On walls where they may have to be restricted for space, annual pruning may be necessary each winter; this should consist of cutting back to two or three basal buds of the current year's growth.

Probably the finest of all these large-leaved vines is *Vitis coignetiae*, an exceptionally vigorous grower with magnificent roundish dark green leaves sometimes 12 inches long and as much as 10 inches broad with an underneath covering of thick brown felt, the whole leaf changing in autumn to various shades of crimson.

Parthenocissus henryana is also a great favourite, a very quick grower with very handsome dark green leaves with three to five slender leaflets; the mid rib and veins with pink and white variegation are particularly

prominent as the leaves turn brilliant red during autumn. In the south these colours are more pronounced if grown on the shady side of a wall rather than in full sun. It is a self-clinging species similar to the Virginian creeper, a plant familiar to everyone, when in autumn its five-lobed leaves turn a brilliant red, and most attractive when attached to some fine architectural feature. It is a very vigorous climber which requires watching as it can be very troublesome and quickly smother other plants if not kept in check.

One of the several interesting species of *Aristolochia* well worth growing is *A. macrophylla* (more often known as *A. sipho*), commonly called "Dutchman's pipe" on account of the flowers bearing a great similarity in shape to that of a Dutch pipe. They are about 1 to 2 inches long, tubular inflated and bent in the shape of a siphon, yellow green in colour; the flat expanding lobes at the end of the flower are brownish purple. It is a very vigorous climber, having deciduous, dark green, handsome foliage making it very useful for quick coverage.

The wisteria, although only a small genus, is probably one of the most ornamental deciduous climbers we have in cultivation. With its long hanging racemes of mauve or lilac-coloured flowers it is such a familiar sight as to need little description. Wisterias are easily cultivated and will grow in any good well-drained soils, but a sunny position is essential to get them to flower well, hence the reason why a wall makes an ideal site. If planted in a restricted area a fair amount of pruning may have to be done to keep them within bounds; usually the long annual shoots not required should be shortened back to about 1 foot in length in August, and again cut back to within three or four buds during the winter.

If left unpruned, plants are apt to develop into a thick tangle of slender intertwining stems, which invariably do not flower—the best sprays are usually produced from buds towards the base of the previous year's growth. However, a certain amount of this whippy growth must be retained when a young plant is being trained in position. *Wisteria chinensis*, or sometimes called *sinensis*, is the most common species grown and many fine old specimens are to be seen in our gardens, many of them having been grown in this country for well over a hundred years. It is a very vigorous grower and if correctly trained in its young state will cover a large wall space and flower freely in May (Fig. 47). Quite often a second but much smaller crop of flowers is produced during August on the current year's shoots. Another beautiful species is *Wisteria venusta*, not such a strong grower but nevertheless well worth growing if space permits. In general appearance it much resembles *W. chinensis*, but the flowers are borne on much shorter racemes, and are a lovely clear white with a yellow tinge at the base of each flower. It is perfectly hardy and comes into blossom after *chinensis* has finished.

Another genus of the legume family which makes a most attractive subject is *Lathyrus pubescens*, a native of Chile, where it is said to grow amongst shrubs and other low-growing trees. Grown in this country

it will come through a mild winter in the south if planted at the base of a sunny wall where it can be allowed to climb by means of its tendrils through other light foliage plants, or better still given the assistance of a few long pea-sticks through which it can ramble. It is a perennial with a sub-shrubby habit growing up to a height of 5 to 7 feet, providing in June clusters of pale violet-blue pea-shaped flowers on long stalks set well above the pale green foliage, a really beautiful plant when well grown. During a hot summer it will produce quite a lot of seed, from which it can be propagated.

I would also like to include several other species of *Lathyrus* which to my mind lend themselves to wall cultivation if given adequate support, although they are perfectly hardy and are often grown in borders, as climbing herbaceous perennials, completely dying to the ground each year. They are *L. grandiflorus*, which will grow up to 6 feet every year, having very large, handsome, violet-coloured flowers comparable in size to the modern sweet pea. Similar in habit is *L. latifolius*, the everlasting pea, which is more robust in growth bearing purple-rose coloured flowers. Equally as attractive is a white coloured form, particularly the variety called 'The Pearl'. These are all excellent for covering the wall between other shrubs.

Some of the most charming of all climbers are the loniceras, the honeysuckles or woodbines, many of which are well known for their fragrance. The genus includes a large number of species, the majority of which are shrubby in habit and have little or no garden value. Of the true climbing types, however, there are some which make fine subjects for growing up walls and the sides of buildings.

The honeysuckles as a whole like a good loamy soil with plenty of moisture to keep them cool at the root; in nearly all cases they like semi-shade, while the flowering parts of the plant are in full sunlight, similar to conditions required by the clematis. Therefore, when planting, a position facing if possible north-west should be chosen.

They require very little annual pruning, except for an occasional thinning out of any old or weak growth, tying in all new growth where ever possible. Several species are well worth mentioning by name, the first being *Lonicera tragophylla*, a vigorous deciduous honeysuckle with large bright yellow flowers, probably the best yellow seen in honeysuckles, borne in large clusters during June and July contrasting with the oval-shaped glaucous leaves. One great disappointment of this lovely plant is that it has no fragrance. It is perfectly hardy and seems to thrive best if planted in semi-shade. *Lonicera sempervirens*, the trumpet honeysuckle, is a very beautiful species, but unfortunately it is a plant which only does really well in the gardens of the south and west or in other parts of the country with similar climatic conditions. From June until the autumn its whorls of bright orange scarlet blossoms which are offset well above the glaucous, green, oval-shaped leaves will continue to flower. Arising out of these two species is a hybrid, *Lonicera tellmanniana*, combining the good qualities of both its parents. It is a

robust deciduous grower with terminal clusters of tubular flowers pale yellow in colour tipped with red in the bud stage. It is hardy, a good character which it inherits from *L. tragophylla*, and a first-class plant for walls; it appears to do well in a semi-shaded position or at any rate where the roots and the lower part of the stem are shaded by other plants.

No selection would be complete without *L. etrusca*, a very fine Mediterranean species, which requires the protection of a south wall if to be seen at its best, having the same type of growth as the common species but freer and more vigorous; the very fragrant flowers, yellow tinged with red, begin to open in July and go on flowering until the autumn on the upper parts of the current year's growth (Fig. 46).

So far I have given a selection of plants which are either strong-growing climbers or those which will cover a large amount of wall space if allowed to do so. There are, however, often spaces available for plants that can be grown on or against low walls 3 to 5 feet high, or quite often at the foot of higher walls already occupied by larger-growing shrubs or climbers which have left bare spaces at the base.

To start with there is a very handsome plant, *Abelia floribunda*, probably the most beautiful of all the abelias, having rosy-red, pendulous, funnel-shaped flowers, arranged on long arching stems during June and July. For a south or west wall this shrub with its shining leaves is most attractive. *A. grandiflora*, a hybrid between *chinensis* and *uniflora*, is another delightful plant, with white and pink blossom and comes into flower from July until the autumn; it has a very graceful habit and is most useful flowering so late in the season.

Another great favourite of mine is *Carpenteria californica*, an evergreen shrub with a very neat habit of growth. It does require a hot sunny position and a soil which is very well drained. The large white flowers, not unlike those of a large single rose, are produced in terminal clusters of from three to six flowers through June and July it is a very notable and handsome shrub when in flower.

Chimonanthus praecox, the well-known "Winter Sweet", is a very old and delightful shrub introduced from China as far back as 1766, and ever since has been a great favourite because of its sweetly scented flowers. Although perfectly hardy in the open ground it does benefit from the protection of a sunny wall, as it comes into flower from December and keeps on intermittently until March when the weather is favourable. The flowers are borne on the previous summer's growth, the outer petals greenish yellow, the inner ones purplish; they have no particular beauty but will always be cherished for their fragrance and earliness.

In the variety *luteus*, which to my mind is a much finer plant, the flowers are large and all the petals are yellow, but it is less fragrant than the type.

Coronilla glauca, belonging to the *Leguminosae*, is a very old but most attractive plant for a warm sunny position, with quite a neat bushy habit of growth with clusters of rich yellow pea-shaped flowers, which make

good contrast to the glaucous green pinnate leaves (Fig. 48). It is a plant which flowers for a considerable period from April until June and quite often again in the autumn. Also belonging to the same family is *Anthyllis barba-jovis*, better known perhaps as "Jupiter's Beard", a very interesting plant, which is too tender to grow in the open but makes a charming shrub for a wall where its silver-grey sheen and pale yellow flowers are very effective.

Desfontainea spinosa is also a very beautiful evergreen shrub, with small holly-like green leaves and large conspicuous red-and-orange tubular flowers, blooming from July to September. It will come through most winters unharmed in the milder counties of the south and south-west, and many fine specimens are to be seen about the country when grown against a wall. It appears to thrive best on one facing north-west, or where it is sheltered from the hot sun and in a moist loamy lime free soil (Fig. 45).

Another very distinct and interesting subject worth cultivating is *Erythrina crista-galli*, perhaps better known as the coral tree. It likes a warm sunny sheltered position at the base of a wall. An established plant has a very thick woody rootstock from which arise strong annual shoots, 6 to 8 feet in length, bearing oval-shaped coriaceous leaflets more or less glaucous green in colour, terminating into a large inflorescence of very conspicuous deep scarlet flowers in autumn (Fig. 39).

To encourage strong healthy flowering shoots the following season, these long annual growths should be cut hard back to within a few inches of the base of the root-stock each spring, before new growth begins. Being a native of Brazil, this plant is considered to be only half-hardy in most parts of the country, and therefore the rootstock should be covered with some form of protection against severe frost, a good thick covering of dried bracken fern or other similar material will keep away many degrees of frost.

So far no mention has been made of the jasmines, a very large and useful race of garden plants, some of which are very sweetly scented and well suited for growing on walls. Probably the best known of all is *Jasminum officinale*, the common white sweetly scented jasmine which has been in cultivation in gardens so long that the date of its introduction is not known. Although perfectly hardy in the south of England it lends itself admirably for training up walls, pillars, etc., and looks most effective in flower when its long deciduous shoots bearing sprays of pure white blossom are growing through or over other vegetation. It flowers throughout the whole of the summer.

Then, of course, there is the yellow winter-flowering jasmine, *J. nudiflorum*, which again is quite hardy in the open but if grown against the shelter of a wall comes into flower earlier and is not so likely to be disfigured after severe frosty weather. It is a first-rate plant for giving a bright display during mid winter. One other species I should like to mention as being an excellent plant is *J. floridum*, a neat evergreen shrubby type with numerous yellow flowers from July to September in loose panicles.

Abutilon megapotamicum, although a native of Brazil, makes a very graceful evergreen shrub for growing on a sheltered warm wall where it will come through an average winter unharmed. The bright coloured pendulous flowers of red and yellow are produced on long slender growth, throughout the summer and with great profusion, making it a most attractive plant (Fig. 37).

Also requiring the shelter of a warm south or west wall is *Clianthus puniceus*, one of the many beautiful plants native to New Zealand. This is an evergreen scandent type of shrub growing anything up to 6 or 8 feet in height, while in the very favoured localities it will grow even taller. It has dark green pinnate leaves from 4 to 6 inches long, made up of many leaflets. During the summer months the brilliant red and curious-shaped flowers are borne on pendulous racemes from the leaf axils of the current season's growth. It is on account of these long, pointed, recurved, keel petals that the plant is commonly called the Parrot's Bill, which the flowers closely resemble. This is undoubtedly a plant best suited for the milder parts of the country, and even then may require some light protection during the winter months. It prefers a very open well-drained sandy soil (Fig. 38).

The following selection includes a few plants which are particularly dwarf in growth and ideal for growing under low walls or under windows where space is rather limited.

Teucrium fruticans, a dwarf evergreen shrub having grey-green leaves and lavender-blue flowers which continue to appear during summer and autumn. *Lavendula stoechas*, with its characteristic large purple bracts. *Penstemon cordifolius*, one of the Californian evergreen shrubby type, a very showy plant with beautiful scarlet tubular-like flowers, flowering continually from June until August. Mention must be made of at least one of the evergreen veronicas of which there are many well suited for walls, but for beauty and size of flower the most attractive of all is *Veronica hulkeana*, with lustrous green leaves with loose spikes bearing a profusion of lavender-coloured flowers—a really first-class plant. *Salvia grahamii* and *S. neurepia* are two very good sub-shrubby species well worth growing at the foot of a warm wall for their very brilliant scarlet flowers; the latter flowers very late in the summer.

The common myrtle, *Myrtus communis*, makes a neat and pleasing shrub with its brilliant dark green leaves contrasting with the large, white, rounded flowers during July and August, while the variety *tarentina* having smaller leaves is a much more dainty shrub than the type and equally as beautiful when in flower.

Where spaces permit there is quite a wide selection of various types of half-hardy bulbous plants that can be successfully grown if given a warm sheltered position, particularly at the front or amongst some of the dwarfer types of shrubs where the flowering spikes can come up through the foliage of the shrubs which at the same time provides some cover or protection for the bulbs during the winter.

I have in mind subjects such as *Amaryllis belladonna*, the pink and

white flowering varieties and *Nerine bowdeni*, both plants having lovely trumpet-shaped flowers on long stems in autumn. Similar treatment can also be given to *Watsonia*, another half-hardy South African bulbous plant, the species *coccinea*, *iridiflora* and *meriana* all flower from June to August.

Tigridia species from Mexico, in particular *T. pavonia* and its varieties, are also worth growing as they have such handsome flowers, heavily spotted in a variety of beautiful colours, giving them a very exotic appearance.

The Kaffir lily, *Schizostylis coccinea*, and the beautiful rose-coloured variety 'Mrs. Hegarty', which flower in autumn, are also worth growing. *Crinum powellii* and *C. moorei*, bulbous plants with handsome ribbon-like leaves and large pink trumpet-shaped flowers blooming in June and July are well worth a place.

THE CONTROL OF BLACK CURRANT GALL MITE IN GARDEN AND NURSERY

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THE rounded swollen buds known as big buds will be familiar to most growers of black currants. These are caused by the feeding of the mite *Phytoptus ribis* Nalepa within the developing bud during the late summer. The initial mite invasion of the new bud occurs at a very early stage of development during and just after the blossom period. Comparatively low numbers of mites, from about a dozen to fifty or more, may be found inside these buds during May and June. There is then a rapid build-up of population, accompanied by visible swelling and galling of the bud, and by late autumn thousands of mites may be present in each gall. There is a further population increase inside the gall in the early months of the year, and vast numbers of mites emerge from the burst gall in late April and May to repeat the cycle by invading buds beginning to form in the leaf axils of the new shoots. The effect of a heavy infestation is to reduce cropping potential, while at the same time encouraging the development of weak lateral shoots through the suppression of growth of the terminal and main buds. No varieties in commercial production are immune but it is true to say that certain varieties, such as 'Seabrook's Black', will not develop such high levels of visibly galled buds as the more highly susceptible 'Wellington XXX' and 'Baldwin'.

Unsatisfactory results with traditional lime-sulphur programmes have been reported for many years and the necessity for alternative and better methods of control has been accentuated by the recent growth of commercial interest in the crop. Work in the East Midlands over the past three years has shown that three chemicals, endrin, fluoroacetamide and thiodan, can be relied upon to give better control than lime sulphur or wettable sulphur. While investigating the use of endrin sprays against black currant aphid, leaf curling midge and capsid, COLLINGWOOD and BROCK (1958, *Plant Pathology*, 7, 1–4) found that the traditional period for spraying, namely, "grape stage", was in fact the least satisfactory, and good control of capsid and midge in particular was obtained only with spray applications made at or about the full blossom period. In the same way it was found that while an endrin spray at grape stage had some effect against the mite, satisfactory control was only given by post-blossom applications. It appeared that while endrin and the other chemicals mentioned would destroy mites that had already invaded the new bud, wettable sulphur and lime sulphur did not have this penetrative effect. At the same time spray applications of any of these chemicals made before blossom could not entirely suppress the emergence of large numbers of live mites from the overwintered galls. In the East Midland trials, remarkably good control has been obtained on heavily infested bushes with even single sprays of endrin made at two or three weeks after full blossom, provided that a good wetter was used and spray cover was efficient.

It is now possible to suggest a simple spray programme for both the gardener and the nurseryman that will prevent the build-up of big bud and reduce any existing infestation to a low level. However, there are certain difficulties from the gardener's point of view. Thiodan, the safest of the effective chemicals is not yet marketed in this country. Moreover, results from only one year's trial at one site with this chemical are as yet available. Fluoroacetamide can be obtained for garden use as a 1 per cent. concentrate for aphid control, but its risks from the point of view of the fruit consumer have not yet been evaluated. Endrin has already been shown to be dangerous to wild life and domestic animals and should not therefore be used where there is any risk of these coming into contact with the wet spray. At the same time there is a likelihood of some fruit contamination with post-blossom applications. *It would be necessary therefore to discard the crop entirely for that season* if either fluoroacetamide or endrin were to be used at the period when they were most effective, namely, post-blossom.

Other methods that have been widely tried in the past include picking off the galled buds and cutting down the bushes to the ground after fruiting. Neither of these practices have proved of any value and the main effect of cutting down is merely to spoil the bush from the cropping point of view for the next two seasons. It is better in the case of heavy infestations either to consider grubbing entirely or to cut out much of the older wood so as to make good spray coverage easier to

obtain the following spring. The importance of planting from good certified stock cannot be overstressed, and on no account should material from neighbouring gardens or allotments be used for propagation as this is almost certain to be either mite infested or reverted, or, more probably, both. Starting with clean stock it may be some years before substantial big bud infestation builds up and the decision may then be taken as to whether to concentrate on a cleaning-up spray operation for one year or to grub and start a fresh planting elsewhere. An alternative suggestion would be to spray regularly year after year with endrin at the first open blossom, as this early application would not contaminate the fruit but should maintain an already clean stock in that condition over many years.

Spray recommendations for the commercial gardener then would be as follows: for cleaning up heavily infested bushes, spray with either fluoroacetamide at a dilution of 1 in 10 of the 1 per cent concentrate at present available for garden use, or with endrin at 2 oz. of 20 per cent emulsion per 5 gallons water, just as the first flower opens, and then again three weeks later. A good wetter such as sodium dioctyl sulphosuccinate at ½ oz. of the 20 per cent material per 5 gallons is desirable with both chemicals. The sprays are best applied with a pressurized knapsack at high volume (about a gallon of wash to five bushes) so as to wet the bush completely. Protective clothing, including rubber gloves, boots, face shield and mackintosh, must be worn when applying these chemicals at the strengths recommended; *the crop may not be picked for human consumption in that season and domestic animals should be kept away from the wet spray.*

For the amateur a safer alternative recommendation is to apply 2 per cent lime sulphur just before blossom, together with 0·1 per cent DDT, for the control of other pests, including capsid and aphid, and to follow with 1 per cent lime sulphur three weeks after. This will not give such good results as endrin but may at least prevent the infestation from increasing. Some foliage scorch and blossom run off may result from the use of sulphur sprays, especially if spraying is followed by a cool frosty night but these effects are seldom severe in eastern England. In Northern Ireland, where there is greater risk of sulphur injury, it has been the regular practice for some years to spray with a 2 per cent refined petroleum oil at full blossom. This recommendation follows some promising observations by H. GOUDE (1935, *The Horticulturist, Norfolk County Council*, **21**, No. 3) and appears to have given some useful results. In south-east England there may be a risk of severe damage, including leaf fall, with this material, but its use may be worth considering in the wetter areas of west Britain.

For the prevention of build-up of mite in bushes that are substantially free from visible signs of infestation, it is suggested that regular applications of endrin at the rates quoted above be given at the first open flower. With this one application there will be no risk of crop contamination but the other precautions mentioned should be observed.

The alternative would be the lime-sulphur programme outlined above, but for pre-blossom sprays, endrin is more reliable than either sulphur or fluoroacetamide, while at the same time giving good control of aphid, capsid and midge.

Recommendations for the nurseryman can be very simple as no considerations of spray residues, damage to pollinating insects or to domestic animals need apply. Nursery plantations can be kept free from aphid, capsid, midge and mite with two applications of endrin, the first at full open blossom and the second three weeks after. Endrin should be used at the rate of 1½ pints of 20 per cent emulsion per 100 gallons wash, together with 4 oz. of 60 per cent sodium dioctyl sulphosuccinate, or similar succinate wetter at an equivalent rate. A knapsack sprayer is most easy to manipulate so as to provide good cover but large areas may be sprayed with a hand lance from a power sprayer, or with an automatic sprayer with fixed nozzles, provided careful attention is given to ensure that the foliage and leaf axils are thoroughly wetted.

When planting up a nursery, cutting beds should be sited as far as possible from old stool beds or fruiting bushes so as to minimize any risk of contamination. The insulating effect of surrounding hedges, shrubs or trees is an additional advantage. When taking cuttings for propagation it is also possible to ensure freedom from mite by treatment with fluoroacetamide. Mites within the buds will be destroyed by immersing the cuttings in a 0.2 per cent solution of fluoroacetamide for ten minutes. The cuttings should be planted immediately after treatment. This method works best in November and December, when there are few or no mite eggs which might be partly resistant.

NOTES FROM FELLOWS

Foliage Border at Hampton Court, 1958

THE border was first planted in 1953 to show what could be accomplished by using plants with coloured foliage only, to give a brilliant display throughout the summer season (Fig. 49).

The site selected for the border is near the roots of the Great Vine, having as its permanent background a hedge of pleached limes and clipped yews in two parts. To give height to the long foliage border we use tall plants of *Eucalyptus globulus*, *Grevillea robusta*, *Humea elegans*, and *Polygonum lanigerum*.

Plants are then graduated to height, using such plants as *Gnaphalium microphylla* (these being grown as feathered standards), cannas with deep red leaves in variety, Dahlia 'Bishop of Llandaff', jacaranda, *Abutilon thompsonii* and *A. savitzii*, *Coleus* in their infinite variety, *Irisine*, *Arundinaria*, down to the dwarfer plants, including flower garden and

willow-leaved beet, *Veronica andersonii*, *Echeveria*, *Calocephalus brownii*, *Senecio greyii* and prostrate forms of *Coleus*.

This type of border can have many variations, in fact anything with an attractive and coloured foliage may be incorporated in it; the ones I have mentioned are those we use at Hampton Court, but to obtain the best effect it is desirable to make bold groups rather than to use individual plants.

J. M. FISHER

Lewisia howellii and Seedlings

Lewisia howellii is a native of North America and is to be found in Oregon and California. It is a race of quite hardy plants and has attained prominence in the last twenty years. These plants are quite easy to propagate from seed, and one frequently finds seedlings in the shingle around the plant. Lewisias produce rosettes of narrow fleshy foliage, crimped at the edge. The flower heads radiate on 4- or 5-inch stems of whitish pink striped flowers.

About twenty years ago a kind friend gave me two plants of *L. howellii* which were planted in the open on a shelf at the base of a large rock. The soil was well prepared with good loam, peat leaf-mould and a very generous amount of sandy grit. One inch of shingle was placed round the neck of the plants. They flourished and I was able to save seed. Seedlings also appeared in the shingle.

After a few years a pale pink seedling appeared; this was kept separate from the other seed, saved, and grown on. In 1948 I discovered a beautiful rose-coloured form which I tried to increase by leaf cuttings but without success. However side shoots developed and I was able to obtain a few more plants. In 1951 the good pink form received an Award of Merit under the name of *L. howellii* 'Weald Rose' (Fig. 50).

Since then I have concentrated only on seed saved from this plant and have obtained very interesting results of varying colours from deep rose to orange and pale yellow.

For pot culture the soil must be very open and fairly rich. Personally I make up a mixture of one part loam, one part peat and leaf-mould and nearly one part sand and shingle. I add to this barrowful of mixed soil, two handfuls of fish-meal. After crocking the pots I put some dry cow-dung at the bottom as the plants are gross feeders.

It is interesting to relate that I discovered this year two *L. howellii* healthy plants flowering in the original bed which must have been planted there quite eighteen years ago.

A. G. WEEKS

Limpsfield,
Surrey.

European Variety of Rhododendron ponticum

From a recently published map purporting to give the world distribution of the genus *Rhododendron* it would seem that it is not generally

known that the European variety of *R. ponticum*, sometimes called *R. beaticum*, is found in Spain as far south as the hills overlooking the Straits of Gibraltar, that is to say within sight of, and at no great distance from, the African continent. There, as in Portugal, the plant is strictly confined to the shaded banks of woodland torrent beds. It is somewhat local but common enough where it occurs.

COLLINGWOOD INGRAM

Winter Aconites

The carpet of aconites, Fig. 40 (*Eranthis hyemalis*), sweeps over the upper reaches of a steep hillside facing south-west, under a row of horse-chestnut trees which were planted by one of my ancestors between the years 1812 and 1825. The area covered now measures approximately 53 yards long by 12 yards deep.

In 1860 his grandson came to live at the place and from early youth worked and planned in the garden with great enthusiasm. He collected seeds while touring in Switzerland and planted trees extensively. These include a *Magnolia tripetala*, a *Liriodendron tulipifera*, an *Arbutus unedo* and a glade of *Ilex*.

The soil on the top of the ridge is upper greensand (malm). The success of this growth of aconites is certainly due to the situation and to the protection of the horse-chestnut trees. It is interesting to note that the aconites do not spread nearly so abundantly under the neighbouring beeches. Throughout the winter the bank is open to the late autumn and winter sun; during the summer when the aconites have finished seeding, and are drying off, the complete shade of the heavy leaves of the trees prevent all other forms of growth, except for ivy, which is weeded away by hand. In the autumn, the heavy leaves fall and produce a thick mulch for the bank.

I am certain that if by some misfortune the trees were removed the rich succulent grass from the park below would sweep over the bank and extinguish the aconites. There being no other vegetation under the chestnuts, the total development of the aconites, from seedlings to full growth can be easily observed. There is another fine patch of aconites some distance away, along the drive under the limes, elms and sycamores. Here the grass is kept carefully scythed. It is possible that this colony was the original planting and that birds or wind wafted the seed across the ravine to the bank where the main group is. The area is protected from the park and cattle by an iron railing and the branches of the trees have by now reached down to the railings.

The exact year of the planting is unknown, but it is quite probable that the colony may be a hundred years old. In 1910 my grandmother, noticing what she thought were weeds along the path, ordered the head gardener to have them all removed. This was immediately done, but according to my mother, within three years the colony made a very effective show again.

The exact time of flowering varies slightly from year to year, but generally, they begin to flower about the end of the first week in February, and are at their best for the next fortnight. After that they tend to become coarse and lose their freshness. They are quite undeterred by snow and ice, although the snow seldom lies long on the steep slope.

The garden is open on behalf of The National Gardens Scheme at the first three week-ends in February each year.

C. BONHAM-CARTER

Wyck,
Nr. Alton, Hants.

PLANTS TO WHICH AWARDS HAVE BEEN MADE IN 1958

Celastrus orbiculatus (Hermaphrodite form) F.C.C. October 28, 1958. This very lovely climber received the Award of Merit as long ago as 1914 in its unisexual form, as a hardy autumn-berrying climber and the hermaphrodite form, which is more reliable in its fruiting, has now been honoured with the F.C.C. The fruit is a three-valved capsule which splits open when ripe, revealing the brilliantly coloured Fire Red (H.C.C. 15) seeds, contrasted against the Cadmium Orange (H.C.C. 8) valves of the capsule. The fruits are borne in clusters of two to four in axillary cymes. Exhibited by Col. The Lord Astor of Hever, Hever Castle, Edenbridge, Kent.

Campanula cashmiriana A.M. September 2, 1958. This little-known campanula is found growing in rock crevices in Afghanistan, W. Tibet and Kashmir, at altitudes of from 10,000 to 12,000 feet. The woody rootstock penetrates deep into these crevices, and gives rise to a number of thin brown stems covered with a white pubescence, usually erect but sometimes trailing. These stems are freely branched above, and bear numerous solitary pendent bell-shaped flowers on slender pedicels, the whole plant having a rather delicate appearance. The alternate leaves are 1 inch long, elliptic, mostly sessile, and covered with short soft hairs which make them appear grey. The plant exhibited bore about 45 open flowers, Heliotrope (H.C.C. 636/2) in colour, each flower being ½ inch long and rather more in breadth. The whole plant measured 9 inches high and 10½ inches across. Exhibited by Mrs. Lamming, 173 London Road, Ewell, Surrey.

Cornus kousa A.M. October 28, 1958. This excellent plant gained the F.C.C. in 1892 as a hardy flowering tree and has now been given the Award of Merit as a hardy fruiting tree for autumn effect. The globose, fleshy fruits, about 1 inch across are shades of Rhodonite Red (H.C.C. 0022) in colour. Exhibited by Sir Henry Price, Bt., Wakehurst Place, Ardingly, Sussex.

Delphinium 'Great Scot' A.M. July 1, 1958, as a variety for show purposes and for garden decoration. Flower spike 2 feet 8 inches long,

7 inches to 9 inches diameter at base, well proportioned, tapering slightly towards tip. Flower 3 inches diameter, spur 1 inch long, blunt, pedicel 3 inches, Heliotrope (H.C.C. 636/2) overlaid Enamel Blue (H.C.C. 48/3 to 48/2); eye white with yellow hairs. Shown by Messrs. Blackmore & Langdon, Twerton Hill Nursery, Bath, Somerset.

Delphinium 'South Seas' A.M. July 1, 1958, as a variety for show purposes and for garden decoration. Flower spike 2 feet 3 inches long, 6 inches at base, well proportioned, tapering slightly towards tip. Flowers 3 inches diameter, spur 1 inch long, pedicel 2½ inches, Victoria Violet (H.C.C. 738/2) overlaid with French Blue (H.C.C. 43/1), eye white with blue blotches. Shown by Messrs. Blackmore & Langdon, Twerton Hill Nursery, Bath, Somerset.

Gentiana (ornata ♂ × sino-ornata ♀) 'Sinora' A.M. October 11, 1958. Raised by Mr. G. H. Berry in 1943, this attractive hybrid has features reminiscent of both parents. The plant exhibited was in a 6-inch pan, and there were about 50 open flowers and many unopened buds. The trumpet-shaped corolla was just over 1 inch long and 1 inch across the open flower, the reflexed portion exhibiting different shades of Spectrum Blue (H.C.C. 45 to 45/2). The interior of the throat was pale green with a sprinkling of blue spots, while the exterior showed segments which were pale blue alternating with others which were pale green margined with deep green. The tapering lobes of the calyx exceeded the calyx tube in length. The prostrate stems were reddish in colour, and bore pairs of narrow leaves which were just over ½ inch long. The total height of the plant was about 3 inches. Exhibited by Dr. and Mrs. A. W. Taylor, Mount Pleasant, Lamberhurst, Kent.

Liquidambar formosana monticola A.M. October 28, 1958. This handsome tree, a Formosan relative of the well-known "Sweet Gum", *L. styraciflua*, bears large, mainly three-lobed, cordate leaves up to 7 inches in diameter, which colour brilliantly in shades of red during the autumn. Exhibited by The Crown Estate Commissioners, The Great Park, Windsor, Berks.

Nerine 'Paula Knight' A.M. September 30, 1958. This very fine bulbous plant of unknown origin is said to be hardy when planted at the foot of a south wall. Its umbels of about a dozen large flowers are borne on very stiff scapes 2 feet tall. The China Rose (H.C.C. 024/1) flowers measure 3 inches across and are carried on pedicels 2½ inches long. Each segment has a broad central streak of Magenta Rose (H.C.C. 027/1) which deepens toward the margins to (H.C.C. 027). Exhibited by H. J. Joel, Esq. (gr. Mr. A. S. Daffurn), Childwickbury, St. Albans.

Nerine undulata A.M. October 28, 1958, as a bulb for the cool greenhouse. The leaves are narrow and strap-shaped, and the scapes, up to 18 inches high, carry umbels of Fuchsine Pink (H.C.C. 627/3) flowers each with six undulating perianth segments about 1 inch long and ⅛ inch wide. This plant is sometimes known in gardens as *N. crispa*. Exhibited by Lady Wardington, Wardington Manor, Banbury, Oxon.

Picea breweriana A.M. October 28, 1958, known as "Brewer's Weeping Spruce", is in its native habitat a slow-growing tree up to 100 feet or more high with an elegant habit and long drooping branches. In this country specimens of about 30 feet are known. The cylindric cones were about 3 inches long on the specimen shown and purplish-brown in colour. Exhibited by L. F. Schuster, Esq., Compton Park, Salisbury, Wilts.

Rose 'Cocktail' A.M. October 14, 1958. A very useful long-flowering climbing or shrub rose raised in France by M. F. Meilland. The Cherry (H.C.C. 722), single flowers which measure 2½ inches across are slightly scented and have a Canary Yellow (H.C.C. 2/1) base to the petals. Introduced and shown by Messrs. Wheatcroft Bros. Ltd., Ruddington, Nottingham.

Sorbus esserteauiana (Syn. *S. conradinae*) **A.M.** October 28, 1958. An excellent mountain-ash, forming a tree up to 40 feet and given the Award of Merit as a hardy berrying tree. The Signal Red (H.C.C. 719) berries are globose, up to ¼ inch across and borne in panicles up to 6 inches wide. Exhibited by The Sunningdale Nurseries, Windlesham, Surrey.

Sorbus matsumurana A.M. October 28, 1958. A native of Japan, *S. matsumurana* has leaves up to 9 inches long, each with from nine to fifteen leaflets showing excellent, red autumn tints. The shining Poppy Red (H.C.C. 16) berries are ovoid in shape and borne in clusters up to 3 inches across. Exhibited by The Crown Estate Commissioners, The Great Park, Windsor, Berks. (Fig. 27).

Vitis vinifera purpurea A.M. October 14, 1958. A form of the Common Grape Vine, this ornamental climber has very decorative, purple, three- to five-lobed leaves up to 6 inches across and bears bunches of small purple-black grapes in the autumn. Exhibited by The Sunningdale Nurseries, Windlesham, Surrey.

WISLEY TRIALS, 1958

GLADIOLI

One hundred and twenty-seven stocks of gladioli were grown at Wisley in the trial during 1958. Twelve corms of each stock were planted on April 15, 1958. The trial was inspected by a sub-committee of Floral Committee A on July 18 and 25, August 1, 8 and 19, 1958, and on its recommendation the Council has made the following awards to gladioli.

The number in brackets after the description of the variety was that under which it was grown in the trial.

ANTARCTIC. (Raised, introduced and sent by Messrs. Konynenburg & Mark Ltd., Noordwyk, Holland.) **F.C.C.** August 19, 1958. Described R.H.S. JOURNAL, **82**, p. 32 (**A.M.** 1956). [27]

GYPSY LOVE. (Raised, introduced and sent by Messrs. Konynenburg & Mark Ltd.) **F.C.C.** August 8, 1958. Described R.H.S. JOURNAL, **81**, p. 145 (**A.M.** 1955). [19]

ANECDOTE. (Raised, introduced and sent by Messrs. Konynenburg & Mark Ltd.) **A.M.** July 18, 1958. Described R.H.S. JOURNAL, **81**, p. 143 (**H.C.** 1955). [3]

BONANZA. (Raised by Messrs. H. J. Salman & Sons, introduced and sent by Messrs. P. de Jager & Sons, Windsor House, 46 Victoria Street, Westminster, London, S.W.1.) **A.M.** July 25, 1958. Described R.H.S. JOURNAL, **82**, p. 523 (**H.C.** 1957). [35]

CARLA LUPI. (Raised, introduced and sent by Messrs. Konynenburg & Mark Ltd.) **A.M.** August 19, 1958. Plant 5 to 6 feet tall; twenty-one flowers per spike with six open at once. Flowers 4½ inches diameter, French Rose (H.C.C. 520/2) with blotch at throat cream, surrounded by French Rose (H.C.C. 520). [49]

CECIL RHODES. (Raised, introduced and sent by Messrs. Konynenburg & Mark Ltd.) **A.M.** August 1, 1958. Plant 4 feet tall; twenty flowers per spike with seven open at once. Flowers 4½ inches diameter, Rose Red (H.C.C. 724/2) fading to Fuchsine Pink (H.C.C. 627/1) at throat, lower petal at throat Rose Red (H.C.C. 724) with greyish white streak along centre of all petals. [21]

DONALD DUCK. (Raised, introduced and sent by Messrs. Konynenburg & Mark Ltd.) **A.M.** July 25, 1958. Described R.H.S. JOURNAL, **82**, p. 523 (**H.C.** 1957). [4]

GREENLAND. (Raised, introduced and sent by Messrs. Konynenburg & Mark Ltd.) **A.M.** August 1, 1958. Described R.H.S. JOURNAL, **82**, p. 32 (**H.C.** 1956). [29]

GREEN WOODPECKER. (Raised, introduced and sent by Messrs. Konynenburg & Mark Ltd.) **A.M.** July 25, 1958. Plant 4¾ to 5 feet tall; twenty-four flowers per spike with eight open at once. Flowers 4½ inches diameter, Primrose Yellow (H.C.C. 601/2), lower segments at throat Sulphur Yellow (H.C.C. 1/2) with a small blotch of Indian Lake (H.C.C. 826/3), buds Uranium Green (H.C.C. 63/1) when opening. [9]

ICE FOLLIES. (Raised, introduced and sent by Messrs. Konynenburg & Mark Ltd.) **A.M.** August 8, 1958. Plant 4 feet tall; seventeen flowers per spike with six open at once. Flowers 4¾ inches diameter, white, cream at throat. [1]

OSCAR. (Raised, introduced and sent by Messrs. Konynenburg & Mark Ltd.) **A.M.** August 1, 1958. Plant 5 to 5½ feet tall; twenty flowers per spike with six open at once. Flowers 6 inches diameter, Signal Red (H.C.C. 719), slightly splashed dark reddish brown at margin. [78]

PETER GRIMES. (Raised, introduced and sent by Messrs. Konynenburg & Mark Ltd.) **A.M.** July 18, 1958. Described R.H.S. JOURNAL, **82**, p. 525 (**H.C.** 1957). [110]

TOCCATO. (Raised, introduced and sent by Messrs. Konynenburg & Mark Ltd.) **A.M.** August 1, 1958. Plant 4½ feet tall; twenty flowers per spike with six open at once. Flowers 4½ inches diameter, Amber Yellow (H.C.C. 505) flushed Peach (H.C.C. 512/2), lower segments at throat Straw Yellow (H.C.C. 604) with a small blotch of Scarlet (H.C.C. 19). [7]

BLUE CONQUEROR. (Raised by Messrs. H. J. Salman & Sons, introduced and sent by Messrs. P. de Jager & Sons.) **H.C.** August 1, 1958. Plant 4½ feet tall; sixteen flowers per spike with six open at once. Flowers 4¾ inches diameter, Bishop's Violet (H.C.C. 34), gradually deepening towards margin of petals to Royal Purple (H.C.C. 834), small streak of Garnet Lake (H.C.C. 828) at throat. [117]

BLUE IMPRESSION. (Raised, introduced and sent by Messrs. P. Visser, St. Pancras, Holland.) **H.C.** August 1, 1958. Plant 5½ feet tall; twenty flowers per spike with six open at once. Flowers 3⅜ inches diameter, Hyacinth Blue (H.C.C. 40/3) mottled Violet (H.C.C. 36), paler colour towards throat [111].

BLUE LOU. (Raised, introduced and sent by Messrs. Konynenburg & Mark Ltd.) **H.C.** July 25, 1958. Plant 4 to 4½ feet tall; twenty-one flowers per spike with six open at once. Flowers 5½ inches diameter, a colour near Campanula Violet (H.C.C. 37/1), veined and marked Royal Purple (H.C.C. 834) on margins, blotch at throat Royal Purple (H.C.C. 834). [116]

GRANDIOOS. (Raised, introduced and sent by Messrs. Konynenburg & Mark Ltd.) **H.C.** August 8, 1958. Plant 5 to 5½ feet tall; twenty-one flowers per spike with seven open at once. Flowers 4⅛ inches diameter, Azalea Pink (H.C.C. between 618 and 618/1), slightly paler colour at midrib. [84]

HERMAN VAN DER MARK. (Raised, introduced and sent by Messrs. Konynenburg & Mark Ltd.) **H.C.** August 1, 1958. Plant 4½ feet tall; twenty-one flowers per spike with six open at once. Flowers 4½ inches diameter, a velvety shade of Dutch Vermilion (H.C.C. 717), small blotch at throat cream. [67]

JACQUELINE. (Raised, introduced and sent by Messrs. Konynenburg & Mark Ltd.) **H.C.** August 1, 1958. Plant 4 to 4½ feet tall; twenty-two flowers per spike with six open at once. Flowers 4 inches diameter, Azalea Pink (H.C.C. 618/2), lightly splashed Azalea Pink (H.C.C. 618) at margin of petal, lower segments at throat Barium Yellow (H.C.C. 503/2). [12]

JANET SMITH. (Raised by Messrs. Chorley Bros., Australia, introduced and sent by Mr. W. Cobley, 6 Oakfield Road, Poole, Dorset.) **H.C.** August 8, 1958. Plant 4½ to 4¾ feet tall; twenty-one flowers per spike with six open at once: Flowers 4⅛ inches diameter, Orchid Purple (H.C.C. 31/2) deepening to Orchid Purple (H.C.C. 31/1) towards margin and slightly splashed Orchid Purple (H.C.C. 31), blotch at throat Orchid Purple (H.C.C. 31/1). [118]

TOPOLINO. (Raised, introduced and sent by Messrs. Konynenburg & Mark Ltd.) **H.C.** August 1, 1958. Plant 4¾ feet tall; fifteen flowers per spike with seven open at once. Flowers 4 inches diameter, Primrose Yellow (H.C.C. 601/2), blotch at throat on lower petals Capsicum Red (H.C.C. 715). [5]

FELLOWS WISHING TO OBTAIN PLANTS RARE IN CULTIVATION

IN response to the notice published on assistance in obtaining plants rare in cultivation, on page 4 of the January issue of the JOURNAL, the following requests are published. Will any fellow who is willing to offer one of these plants, please communicate direct with the Fellow who is seeking it, and *not* with the Editor.

Fellows requiring plants or seeds in this connection should send their requirements to The Editor.

Abies magnifica	Miss A. B. Beakbane, 27 Bower Mount Road, Maidstone, Kent.
Celsia bugulifolia	H. C. Pugsley, Esq., Arboretum Lodge, Grove Street, Derby.

Vitis vinifera 'Anna Maria' (U.4)	B. G. Furner, Esq., 87 Whitehall Lane, Slade Green, Erith, Kent.
Colchicum luteum and *C. montanum* or *C. hungaricum*	Miss H. M. Brown, Longformacus, Duns, Berwickshire.
Dionoea muscipula, *Hibiscus esculentus* (seed), *Protea cynaroides*	Hilary Corke, Esq., Eversheds, Abinger Hammer, Surrey.
Lapageria rosea var. *albiflora* or var. *superba* (not *rosea* form)	Miss I. M. Vaughan, Alanwood, Ebberston Road, Colwyn Bay, Denbighshire.
Primula floribunda and *P. verticillata*	A. H. H. Stow, Esq., Rural Science Department, Shenstone Training College, near Kidderminster, Worcestershire.
Phlox nana ensifolia, *Globularia stygia*, *Jankaea heldreichii*, *Silene hookeri*, *Campanula zoysii*	J. Kenneth Goody, Esq., Weldon, Carr Wood Road, Bramhall, Cheshire.
Magnolia cordata	S. L. Burgess, Esq., Hill Cottage, Logmore Lane, Westcott, near Dorking, Surrey.
Orchis simia	G. W. Heney, Esq., 28 Haileybury Avenue, Enfield, Middlesex.
Orchis foliosa, *O. elata*, *Poterium dodecandrum*	Mrs. Elliott, Broughton Place, Broughton, Biggar, Scotland.
Bouvardia humboldtii corymbiflora or *B. longiflora*	Mrs. Campbell N. Watson, Powys, Sidmouth, Devon.
Fritillaria conica, *F. pineticola*, *F. karelinii*	Rear-Adml. P. Furse, C.B., O.B.E., Hegg Hill, Smarden, near Ashford, Kent.

BOOK NOTE

"The Rhododendron." Edited by Beryl Leslie Urquhart, with reproductions of paintings by Carlos Riefel. 40 pp. text. (Leslie Urquhart Press.) £5 5s.

The much anticipated *The Rhododendron* proves well worth waiting for and even in these days when colour reproductions are common-place, the quality of the plates of this colourful book is a joy to behold and ponder over.

The artist, Baron Carlos Riefel, has given a lifelike and almost stereoscopic effect to the eighteen species depicted. They vary from the blood-red *R. thomsonii* to the vivid yellow *R. valentinanum*, from the blue *R. augustinii* to the large white *R. lindleyi*. Apart from the exquisite colouring of the flowers, and little criticism can be made on this score, he has carefully shown the characteristic features of each species. Equally if not more important, he has drawn the foliage with great care, displaying in many cases the underside of a leaf. Rhododendrons are a genus which can be identified throughout the twelve months of the year by their foliage, so this latter feature is just as important as the flowers for recognition purposes.

The script of the book is largely devoted to the explorers and plant collectors to whom we owe almost entirely the large numbers, types and range of rhododendrons that are growing in our gardens today. The clearly defined map of the regions where this genus have their home is most instructive, showing where each collector worked. It is regrettable that as fast as travel becomes easier, so political situations render it more difficult—if not impossible—to explore further.

The arrangement of all the plates at the end of the book, divorced from their captions, is not very convenient for studying the illustrations; this and the absence of an index we hope will be remedied in subsequent volumes which we are promised, and, without doubt, this first book certainly whets our appetite for further works to come.

GILES LODER

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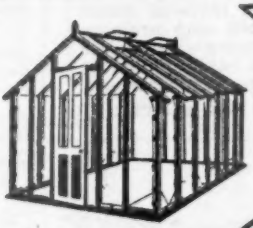

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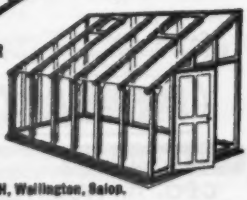

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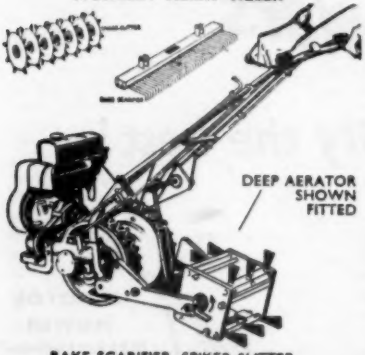

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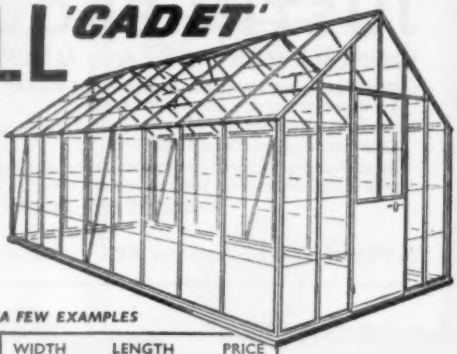

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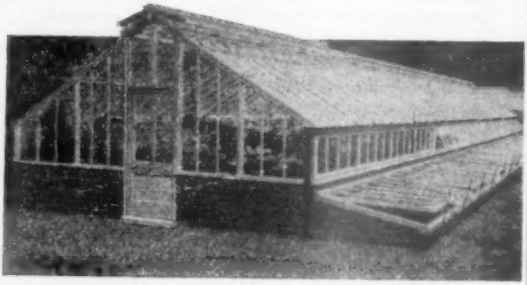

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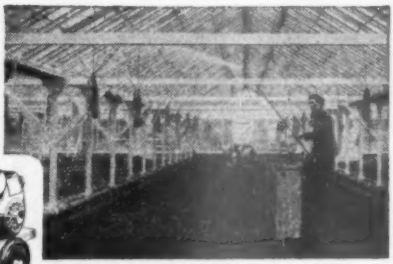

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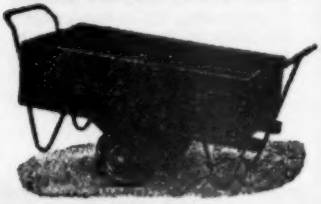

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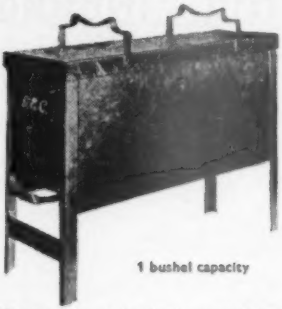

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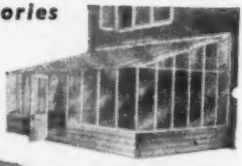

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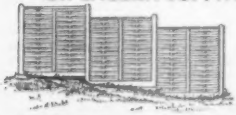

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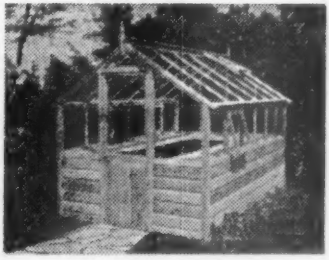

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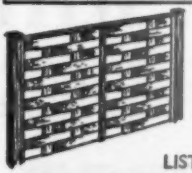

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Printed by Spottiswoode, Ballantyne & Co. Ltd., London and Colchester